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Precision Metal Molding

MAY
1956

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See Page 3

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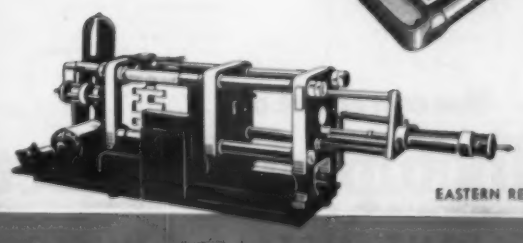

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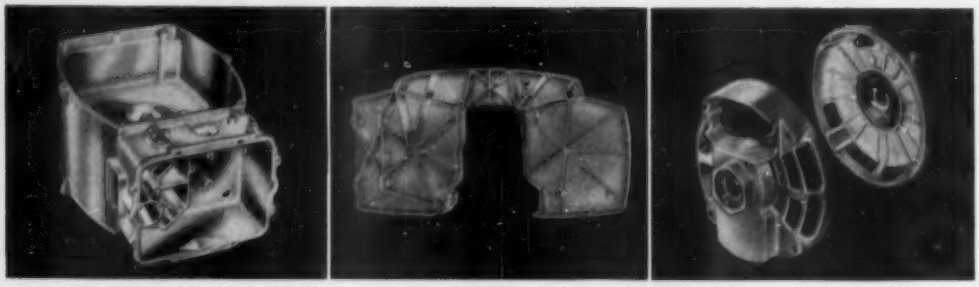

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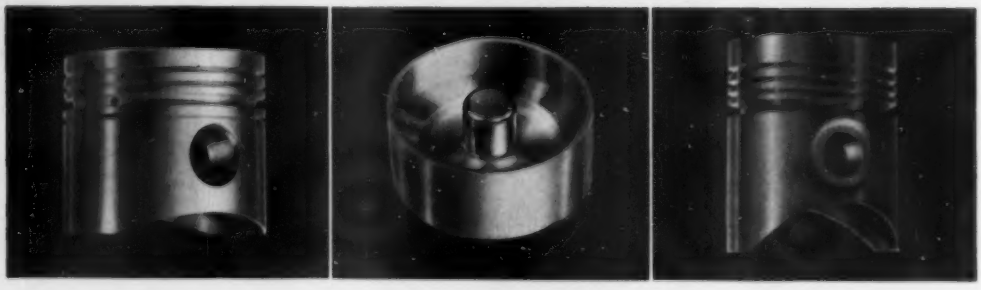

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COVER STORY

Allison demands that powdered titanium parts have uniform high density and properties comparable to those of wrought or forged material. This jet engine compressor bearing support suggests other possible aircraft applications. For a report on titanium powder metallurgy, see page 38.

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MAY, 1956 VOLUME 14 NUMBER 5

Precision Metal Molding

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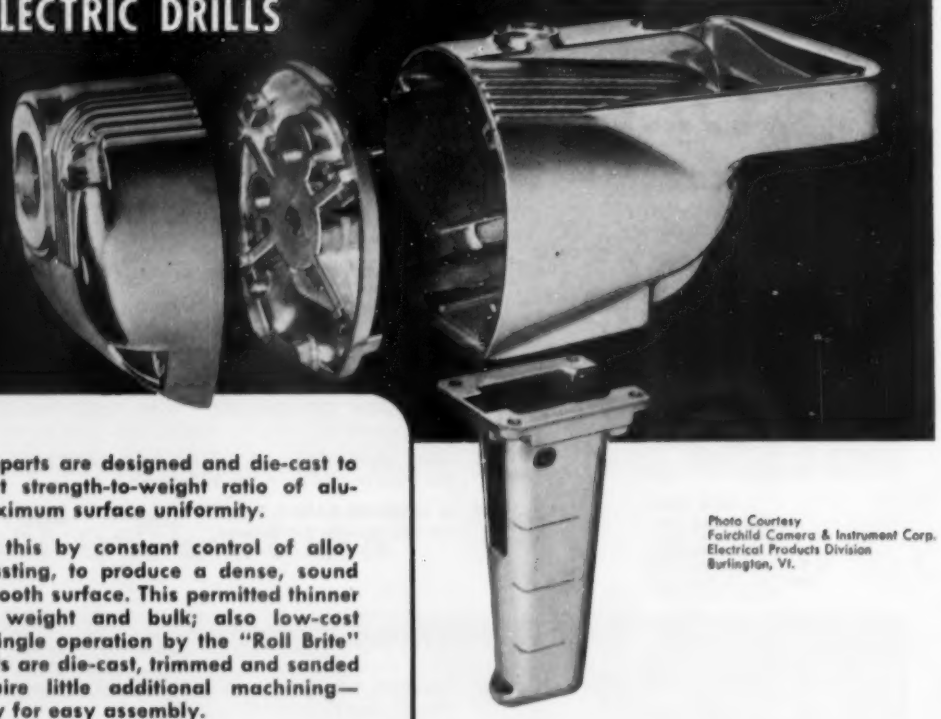

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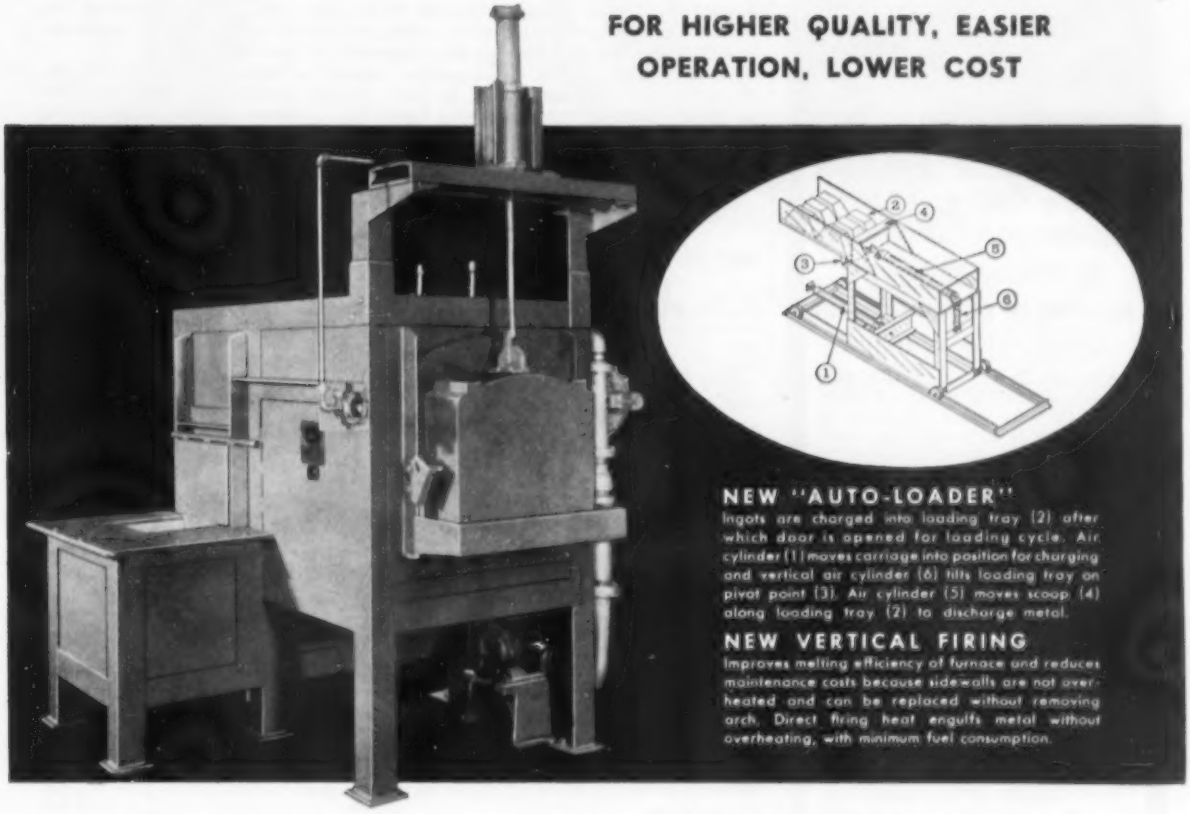
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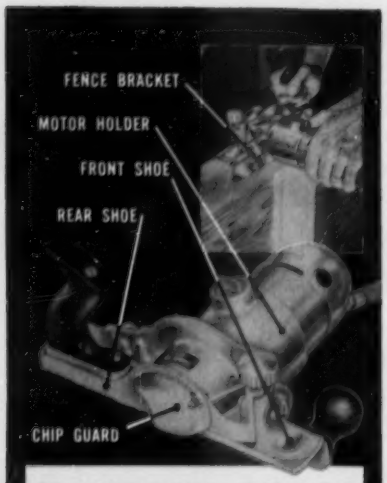

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CASTING ABOUT

IRON POWDER SHIPMENTS in 1955 were about 16 times what they were in 1943 and nearly twice those of 1954, according to figures released by Robert Ziegfield, secretary of the Metal Powder Association. In 1955, he told an AIME powder metallurgy group, shipments of domestic iron powder exceeded imported iron powder for the first time since immediately after the war, and were, in fact, about twice as large as the shipments of imported material.

Other factors in the metal powder supply situation delineated by Mr. Ziegfield . . . average value of iron powder shipped in 1954 was 9.8¢ per pound, with the range between 7 and 12¢ . . . domestic capacity, including some facilities yet to be completed, is estimated at a little over 50,000 tons per year, compared with total shipments in 1955 of 32,000 tons (of which 11,000 tons were imported).

Here are his tabulations of statistics gathered by MPA:

METAL POWDER SHIPMENTS

Year	Iron Domestic	Iron Imported	Iron Total	Grain Copper	Copper Base Alloy	Lead	Solder
1943	2,135	——	2,135	6,430	a	725	a
1944	1,720	——	1,720	6,760	a	1,440	a
1945	1,955	——	1,955	6,550	a	4,655	a
1946	2,490	——	2,490	7,370	a	905	a
1947	3,030	——	3,030	8,570	a	780	a
1948	3,320	2,590	5,910	8,130	a	855	275
1949	2,865	3,105	5,970	5,125	a	755	535
1950	3,940	7,610	11,550	12,135	a	a	a
1951	3,705	12,875	16,580	11,960	a	a	a
1952	4,050	5,630	9,680	8,920	a	a	a
1953	6,255	6,965	13,220	11,515	a	a	a
1954	7,835	9,835	17,670	9,670	4,645	2,370	675
1955	20,725	10,985	31,710	11,565	9,600	3,300	860

a. Not available

Note: All figures in short tons

WHERE METAL POWDERS ARE USED[a]

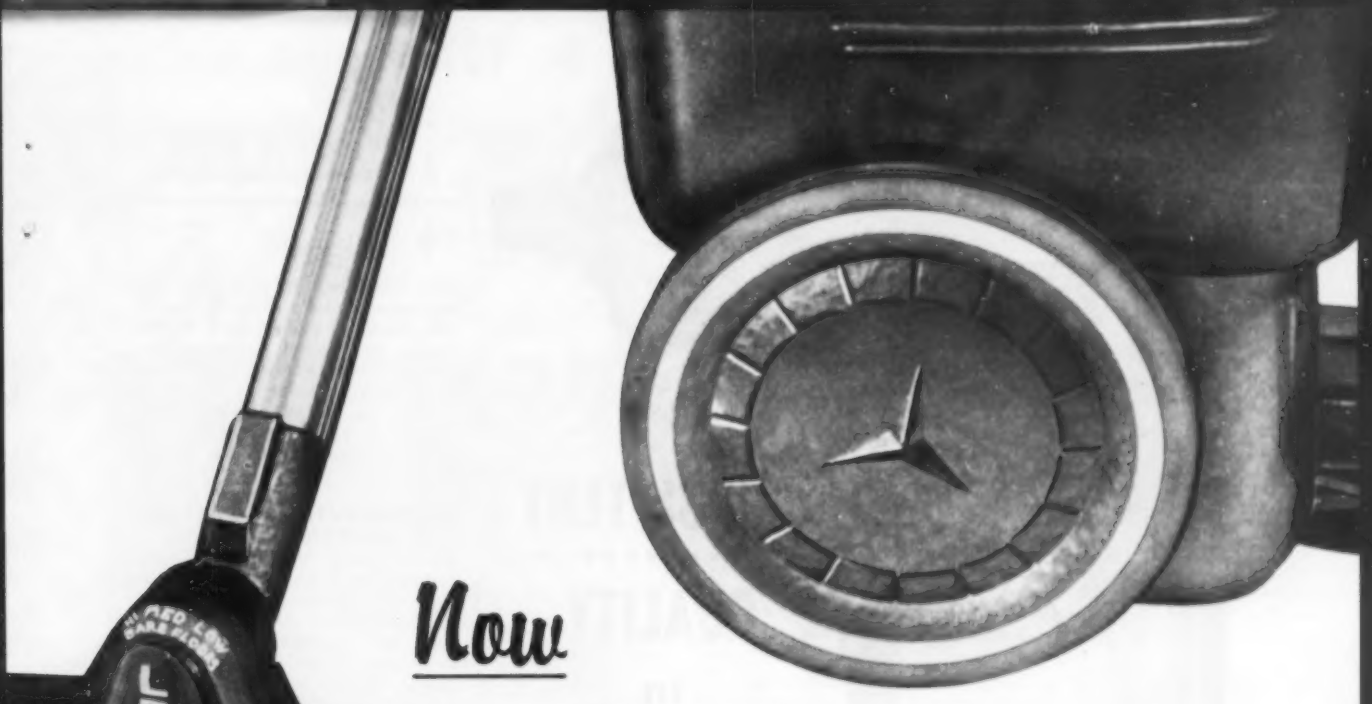
Use	1954	1955
Bearings and parts	20,500	33,100
Friction materials	1,200	2,100
Magnetic cores	900	1,100
Graphite metal brushes	500	850
Lubricants	800	700
Miscellaneous	11,100	19,200
	35,000	57,000

a. Includes iron, domestic and foreign, copper, copper base alloy, lead and solder powders.

AUTOMATED ALUMINUM PISTON PRODUCTION is reported to be operating in one Soviet plant. Returning from a visit to Russian factories last December, A. C. Hall of Bendix Aviation Corp. and N. L. Bean of Ford Motor Co. told an S.A.E. meeting in Cleveland recently that while Russian factories are overcrowded and housekeeping and illumination are poor, automation is being widely introduced and production is being boosted. The two men inspected mainly plants producing machine tools, ball bearings and telephone equipment. They told also of visiting a plant making digital computers capable of handling 8,000 calculations per second.

DESIGN MANUAL ON INVESTMENT CASTING will probably be published near the end of 1956, according to the Investment Casting Institute which has been earnestly at work on this mountainous project. A committee made up not only of practicing investment casters, but also including some of their key customers, has been wrestling with the infinite number of dimensional considerations that enter into the design of investment cast parts for nearly a year now. Under chairman E. G. Chapman of Misco Precision Casting Co., the Institute's Dimensional Tolerance Committee has submitted a master questionnaire, believed to include every facet of design

Continued on page 8



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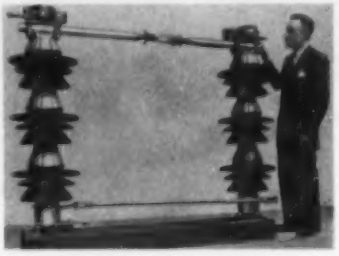
CASTING ABOUT
continued from page 6

and tolerance, to members and and non-members. Committee members handling this job are: William Jenkin of Casting Engineers, Inc.; Robert Kramer of Kolcast Industries, Inc.; Joseph Levine of Investment Casting Co.; Robert Schwarzwalder, Wright Aeronautical Corp.; and Joseph Stannard of Pratt & Whitney Corp.

EXPERIMENTAL HIGH VOLTAGE SWITCH using aluminum for structural members has been designed and built by Pacific Switchgear Div., Federal Pacific Electric Co. Combination of weldments, castings and wrought members have been used in the 115 kv, 600 amp switch. "Object of the experimental switch project," according to R. W. Hutchinson of Federal Pacific, "was to develop practical engineering de-



signs in view of present and probable continuing advantages of cost and availability of aluminum over copper." Top hardware is made of aluminum castings in 356 T6 alloy. The new switchgear was first exhibited in Los Angeles in April.

TITANIUM MELTING and casting by a new process has been developed by a Cleveland firm, Technical Developments Associates. Special feature: horizontal type furnace with water-cooled crucible and non-consumable electrode. Arc melting is employed.

According to William J. Mullaney, company president, the process starts with high purity sponge to produce either billets or castings directly from the furnace. Inert gas atmosphere prevents contamination by oxygen or nitrogen. With this atmosphere, it is believed to be possible to remove both nitrogen and oxygen from the sponge metal and produce cast parts essentially free of all gaseous contaminants.

While the process is still in the developmental stage, considerable interest is reported from some of the major titanium producers because of the possibility of faster titanium production and avoidance of the skyscraper type vertical furnace.

Continued on page 57

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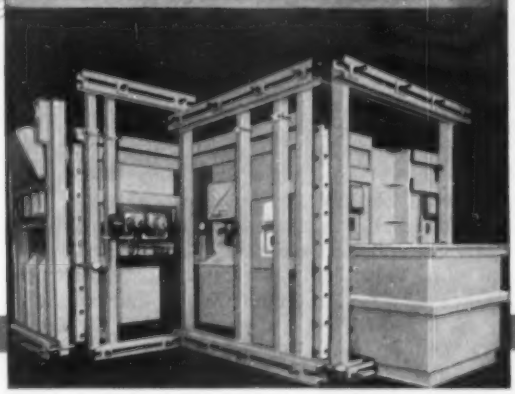

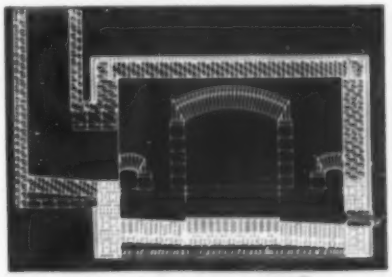

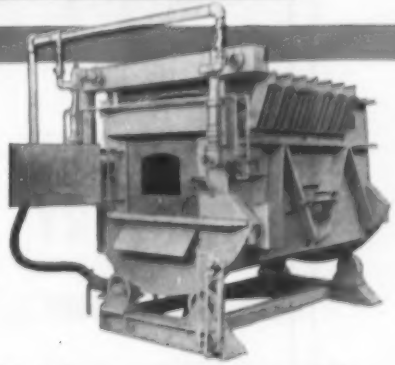

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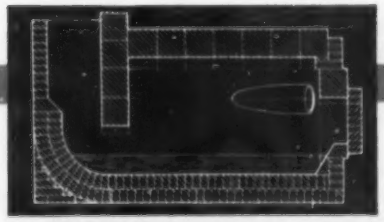

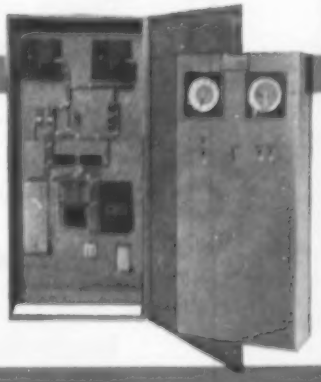

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BETWEEN THE LINES

CAM DESIGN CAN BE IMPLEMENTED by using investment casting as a manufacturing technique. Cutting cam surfaces, or assembling multiple cams within close dimensional relationship is a difficult, though common, problem in machines and instruments having multiple functions. The cost of producing cams can be exorbitant. Yet, with moderate tooling costs and only routine limitations of shape and size, investment casting permits great accuracy, complexity of shape and smooth surfaces. In designing a new ticket marking machine to meet changing sales conditions, Toledo Scale Company found that welding, brazing, staking and riveting complex cam assemblies was both expensive and unsatisfactory. How they redesigned to take advantage of investment casting is told beginning on page 42.

THREE SCIENTISTS REPORT ON TITANIUM POWDER METALLURGY beginning in this issue of PMM. The three, all members of the Research Division of New York University's College of Engineering, have put together a three-part report covering: present status of titanium development; fabrication of titanium using powder metallurgy techniques; and the properties, uses and economics of titanium powder metallurgy parts. Dr. Harold Margolin, head of the Physical and Structural Metallurgy Laboratory, at NYU, one of the authors of the article beginning on page 38, has been engaged in titanium research projects since 1949. Alloy development, transformation studies, binary and ternary phase diagrams and similar work are among his past projects. Dr. R. F. Bunshah, trained in India's Hindu University and Carnegie Institute of Technology, is an associate engineering scientist at NYU, while Dr. Irving

MARGOLIN

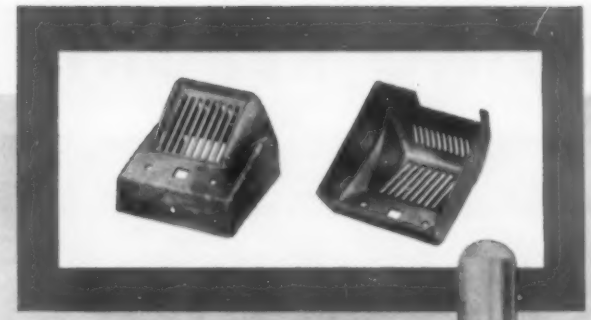
BUNSHAH

CADOFF

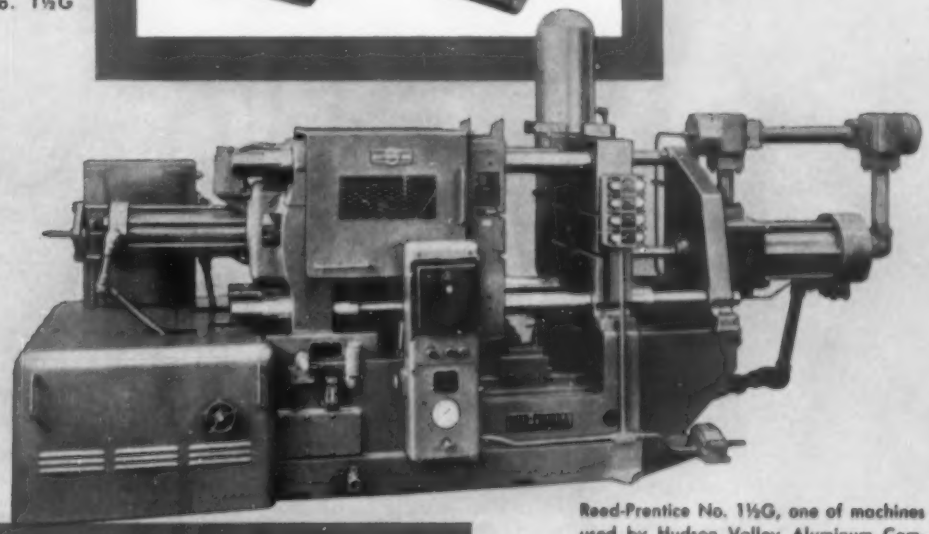
Cadoff is an assistant professor and head of the Solid State Technology Group at NYU's Research Division. Both have conducted research on titanium.

FIRST DIRECTORY OF THE INVESTMENT CASTING INDUSTRY will be featured in June's PMM. It will contain complete listings of: contract investment casters, manufacturers of materials and equipment, and sources for metals and alloys, as well as a tabulation of trade names. Along with the directory will be a section of helpful technical reference material.

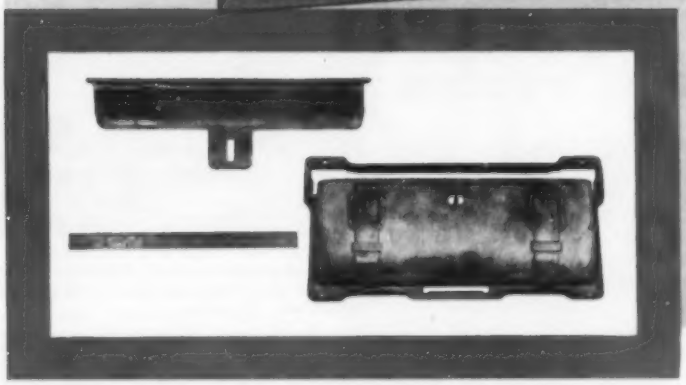
PRE-CUT, SELF-STICKING TAPE can be used for a number of purposes while you are processing your castings. For an outline of some of these applications, look at an article beginning on page 51.



Aluminum intercom box, with open grill work, weighing 2 lbs., was die-cast on a No. 1½G model.



Reed-Prentice No. 1½G, one of machines used by Hudson Valley Aluminum Company, equipped with "Hi-Speed Hi-Pressure" plunger to give uniform dense castings.



This high quality aluminum mail box, requiring very little finishing, is produced by Hudson Valley Aluminum on a Reed-Prentice No. 2G machine. The complete shot weighs 3¼ lbs.

Rugged REED-PRENTICE Die Casters Maintain High Production at Hudson Valley Aluminum

"To take the 20-hour a day production schedule we're running, machines have to be rugged," says Philip Kwiatek of Hudson Valley Aluminum, Inc. in Newburgh, N. Y. "Reed-Prentice cold chamber machines give us dense die castings every time."

Ruggedness is one of many advantages engineered into Reed-Prentice die casters. Full locking tonnage every shot eliminates all "pressure back off," assures uniform dense castings. The "Hi-Speed Hi-Pressure" plunger unit increases plunger speed to 10,000 inches per minute, while an adjustable die stroke helps you cut cycle time.

Send today for full details on Reed-Prentice die casting machines.

REED-PRENTICE

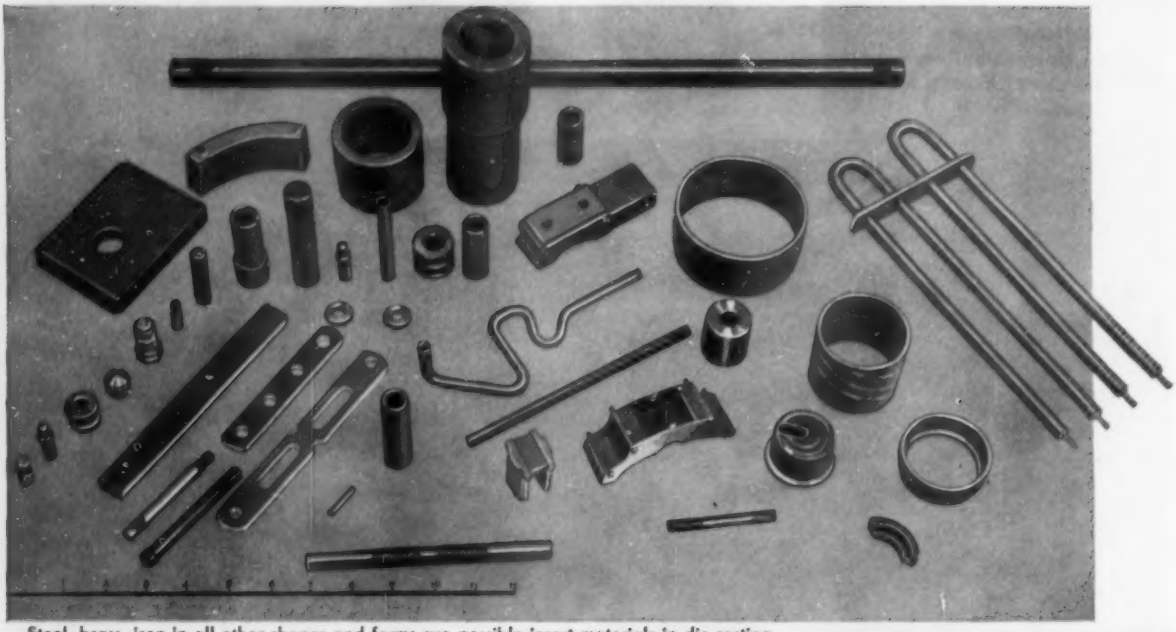
Affiliate of PACKAGE MACHINERY COMPANY

WORCESTER 4, MASS.

BRANCH OFFICES: NEW YORK • CLEVELAND • DETROIT • CHICAGO • BUFFALO • DAYTON • KANSAS CITY • LOS ANGELES REPRESENTATIVES: HOUSTON—STEEL & MACHINE TOOL SALES CO. • MINNEAPOLIS—CHAS. W. STONE CO.

For more information circle No. 52 on the Reader Service Card

DIE CASTING REPORT

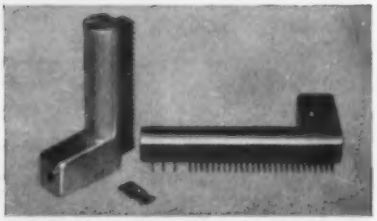


Steel, brass, iron in all other shapes and forms are possible insert materials in die-casting.

Wide variety of inserts, broaden functional use of die casting

The intelligent use of inserts has done much to extend the versatility of die-castings. Some idea of the wide variety of insert materials commonly used in products and components may be gained from the above photo. Steel, brass, and iron (in bar stock, tubing and stamped form) are represented. Even wood has been successfully inserted, and a laminated assembly may be seen in the foreground. Cal-Rod inserts may be seen, too, as well as irregularly bent tubing and common bearing surface inserts. Here are new design possibilities for product engineers seeking ways and means of lowering production costs, without sacrificing functional efficiency.

PRECISION is a national, *integrated* die-casting company, capable of serving your company from product design stages through to assembly and shipment of complete products. Write us for more detailed information. Address: Precision Castings Co., New Business Dept., 222 Walnut St., Fayetteville, New York.



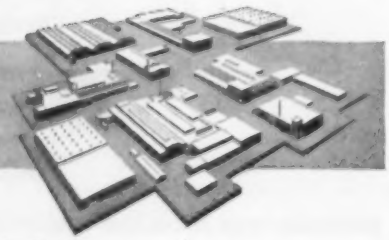
This 2-inch wool comb is a functional component of a textile machine. **Die-cast** in zinc it has 26 steel blade inserts; also cast in aluminum with 29 inserts.

One of the common types of small inserts: The knurled brass threaded insert shown here. This piece measures only 3½ inches outside diameter.

Four identical steel stud inserts are cast in place in this zinc alloy platen toggle frame assembly measuring 12 inches overall. This is a functional unit of a business office machine.

PRECISION CASTINGS CO., INC.

A SUBSIDIARY OF **Harrisburg Steel** CORPORATION

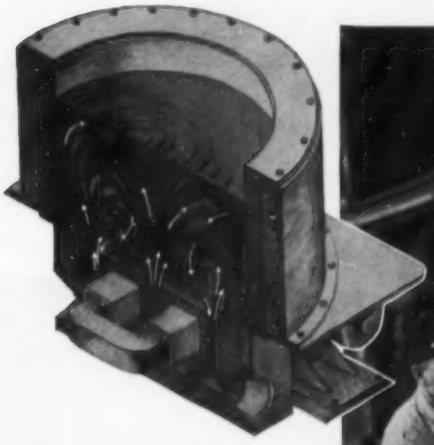


FAYETTEVILLE, N. Y.—SYRACUSE, N. Y.—CORTLAND, N. Y.—NEW YORK, N. Y.
CHICAGO, ILL.—CLEVELAND, OHIO—KALAMAZOO, MICH.

For more information circle No. 50 on the Reader Service Card

HARD-TO-MELT BRONZES SUCCESSFULLY HANDLED
in
AJAX INDUCTION FURNACES

Brass and bronze foundries all over the country have found AJAX-TAMA-WYATT induction furnaces a reliable tool for melting silicon bronzes, aluminum bronzes, leaded bronzes, phosphor bronzes, and other high strength alloys. Operation is highly economical due to the good uniformity of the alloys, low ratio of rejects, drastic reduction of metal losses, and clean operating conditions. This recent development opens the field for the use of AJAX induction furnaces in all foundries where difficult-to-melt alloys are handled.



Cross section of AJAX-TAMA-WYATT twin coil induction furnace such as used at the Torrance Brass Foundry. Heat is produced within the molten metal in the secondary channels and conveyed throughout the melt by electromagnetic circulation, resulting in minimum metal losses and high uniformity of alloy. Temperature is automatically controlled.

Baseball Fans—Do you recognize this man? He is Rocky Bridges, Cincinnati Redleg infielder, keeping in condition during the Winter season at Torrance Brass Foundry, Torrence, Cal.

Photograph courtesy of Long Beach Press-Telegram, Long Beach, Cal.

The furnace pictured above is melting aluminum bronze at the **Torrance Brass Foundry, Torrance, Cal.,** operating at a temperature of 2400 F, for the production of high strength centrifugal castings. This unit is rated 100 kw. Note also the clean, smokeless operation as shown in the unretouched photograph.

AJAX ENGINEERING CORP., TRENTON 7, N. J.

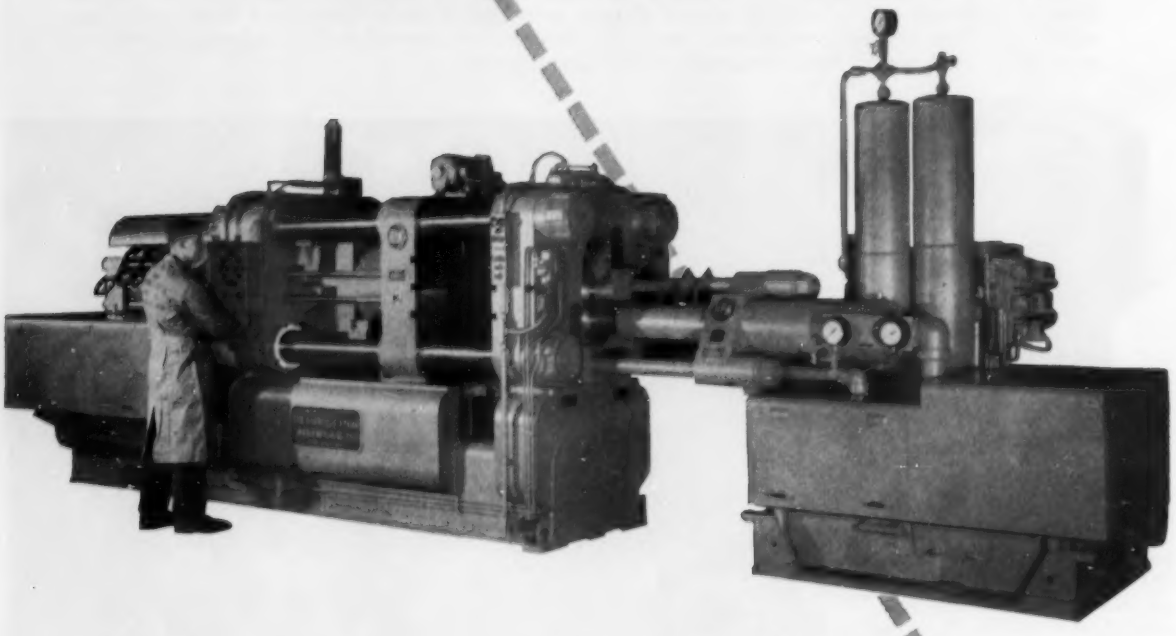
AJAX

INDUCTION MELTING FURNACE

AJAX ELECTRO METALLURGICAL CORP., and Associated Companies
AJAX ELECTROTHERMIC CORP., Ajax Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., The Ajax Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax Wyatt Induction Furnaces for Melting

For more information circle No. 5 on the Reader Service Card

THE INCOMPARABLE H-P-M DIE CASTER



First Completely New Die Casting Machine In 15 Years

This new machine is the answer to many of today's die casting problems . . . cleaner castings . . . negligible scrap . . . better dimensional control with production output to meet any job requirement. It's time proved through four years of development with one year acceptance in the field.

H-P-M's all new hydraulic-mechanical link wedge clamp and new design injection end result in a brand new approach to die casting technique. Accurate closing of mold eliminates excessive flash. The new clamp has plenty of "beef"—clamp locks mold firmly to at least the rated tonnage and "beef" limits die parting on overload during metal injection. The new injection end has unlimited motion control . . . exceptionally high speed. Get the complete story on this new H-P-M before you buy. You'll be glad you did.

Write today for complete specifications for the new H-P-M die casting machines. Available in a range of sizes from 200 to 1500 ton capacities.

DIE CASTING DIVISION
THE HYDRAULIC PRESS MFG. CO.
Mount Gilead, Ohio, U.S.A.

HPM

For more information circle No. 34 on the Reader Service Card

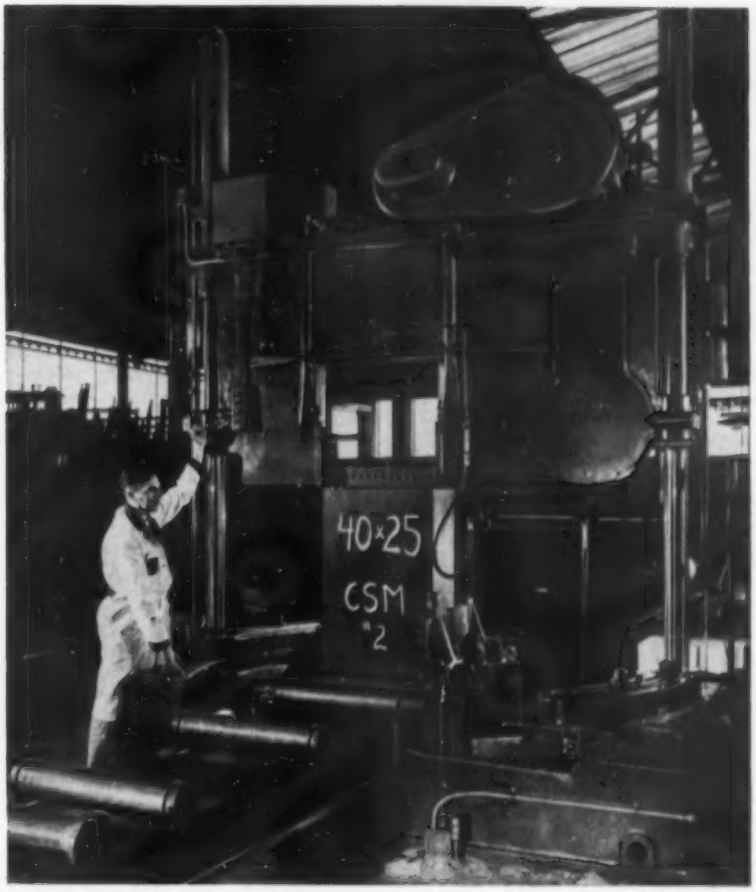


Photo by Hedrich-Blessing

Prompt delivery

of **DIE CASTING DIE STEELS** from warehouse stocks

...every piece ultrasonically inspected

Crucible warehouses from coast to coast stock over 460 sizes of CSM 2 and NU DIE V die casting die steels—1″ to 40″ wide—¾″ to 15″ thick! And they're all available for *prompt* delivery.

What's more Crucible warehouses are equipped to cut die steels to the size you want. The hacksaw pictured above in one of Crucible's warehouses, for example, is the largest made. It can accurately cut die blocks up to 40″ x 25″.

Huge stocks, plus versatile sawing and handling facilities, mean you get the steel you want *when you want it.* There's no need to wait for delivery from mill or forge shop when you can get *prompt* delivery from Crucible warehouse stock.

But there's more. Ultrasonic inspection of *every* piece of Crucible die casting die steel assures *sound die steel quality* every time. So next time you need die steels, look no further than your nearest Crucible warehouse. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

For more information circle No. 19 on the Reader Service Card

DATA OFFERED IN THIS MONTH'S ADS

1. HIGH SPEED CYCLING, over 1000 shots per hour, is possible with the new ABC Die Casting Machine. Bulletin A-10 describes these machines completely.

3. CASTING MACHINE LUBRICANTS that fill every machine manufacturer's specifications are described in bulletin 425, "dag" Dispersions for Metal Casting Operations, from Acheson Colloids Co.

4. INDUCTION MELTING provides the best control of both temperature and composition. For complete details, Ajax Electrothermic Corp. has information bulletins and data.

6. STAINLESS & ALLOY STEEL powders for the fabrication of parts are described and data on processing and properties of parts given in engineering reports from Alloy Metal Powders, Inc.

8. LOW COST, HIGH SPEED die casting machines are described and all of the specifications given in an illustrated folder from the American Die Casting Machinery Co.

10. ALUMINUM ALLOY designed specifically for die casting is fully described and the as-cast mechanical and physical properties together with the chemistry given in specification sheets on alloy Z-39 from Apex Smelting Co.

11. MELTING FLUXES for use with zinc in the die casting industry are the subject of a technical bulletin from Atlantic Chemicals & Metals Co.

13. PLUNGER RINGS said to give exceptionally long life are fully described and user experience given in information available from Auto-Diesel Piston Ring Co.

15. INVESTMENT CASTING ALLOYS tailored to exact specifications are listed together with the chemistry and properties as-cast, in the latest MasterMet Alloy Bulletin from Cannon-Muskegon Corp.

16. FASTER DIE SET-UP that is also easier and safer is described in the latest catalog to be issued by Cast Master, Inc.

17. IMPROVED DIE CASTING production is reported to be possible in literature that has been published on the Model 400-N die casting machine built by Cleveland Automatic Machine Co.

18. FOR ENGINEERING AND PRODUCTION executives, Cleveland Tool & Die Co. has a new brochure detailing the cost savings possible by having experts make your tools and dies.

21. FIRE RESISTANT HYDRAULIC FLUIDS are described and all of their properties given in a new booklet, "Ucon Hydrolubes" that has been issued by Carbide and Carbon Chemicals Co.

22. SPRUE BUSHINGS AND SPREADERS specially designed and water cooled for longer life and better die casting machine operation are described and illustrated in a specification sheet from Detroit Mold Engineering Co.

27. SHELL MOLDING RESINS and the shell molding process are discussed in a booklet that has been issued by the General Electric Co.

29. BRASS DIE CASTINGS with cleaner, smoother surfaces, minimum necessary machining and close tolerances are discussed in a booklet from Hampden Brass and Aluminum Co.

31. DESIGNING FOR INVESTMENT CASTING is the subject of a 12 page booklet that has been published by the Hitchiner Mfg. Co.

32. THE ADVANTAGES & ECONOMIES of die castings are explored in a file folder recently published by The Hoover Co.

34. DIE CASTING MACHINES in all sizes from 200 to 1500 tons are described and complete specifications given in the latest data from The Hydraulic Press Mfg. Co.

36. "CAST TO OUTLAST" is the title and subject matter of a 16 page booklet on investment casting issued by International Nickel Co.

37. MELTING FURNACES for investment casting, such as the new model ID, are discussed in literature from the Detroit Electric Furnace Div., Kuhlman Electric Co.

39. DIE CASTING MACHINES in a wide range of capacities and styles are described and full specifications given in the latest catalog from Lester-Phoenix.

40. RESISTANCE-HEATED MELTING furnaces for use with die casting machines are described in Bulletin No. 321 from Lindberg Engineering Co.

41. DESIGNING FOR DIE CASTINGS is the subject of a comprehensive engineering manual that has been issued by Litemetal Diecast, Inc.

43. CUSTOMIZED CONVEYOR SYSTEMS can be built up from standard components. Complete details on these components are available in literature from May-Fran Engineering Co.

48. RACKS & PINIONS for die casting dies and permanent molds are described and all necessary information given in literature available from Peerless Gear & Machine Co.

51. PLUNGER RINGS designed to give up to 10 times average life are described in literature from Precision Piston Rings, Inc.

52. DIE CASTING MACHINES rugged enough to take steady three shift operation are described in literature from Reed-Prentice.

53. IRON POWDER specifically tailored to give high green and sintered strength with controlled and reproducible dimensional changes is discussed in literature available from the Republic Steel Corp.

55. MELTING FURNACES for all nonferrous metals are described in the latest catalog issued by the Stroman Furnace & Engineering Co.

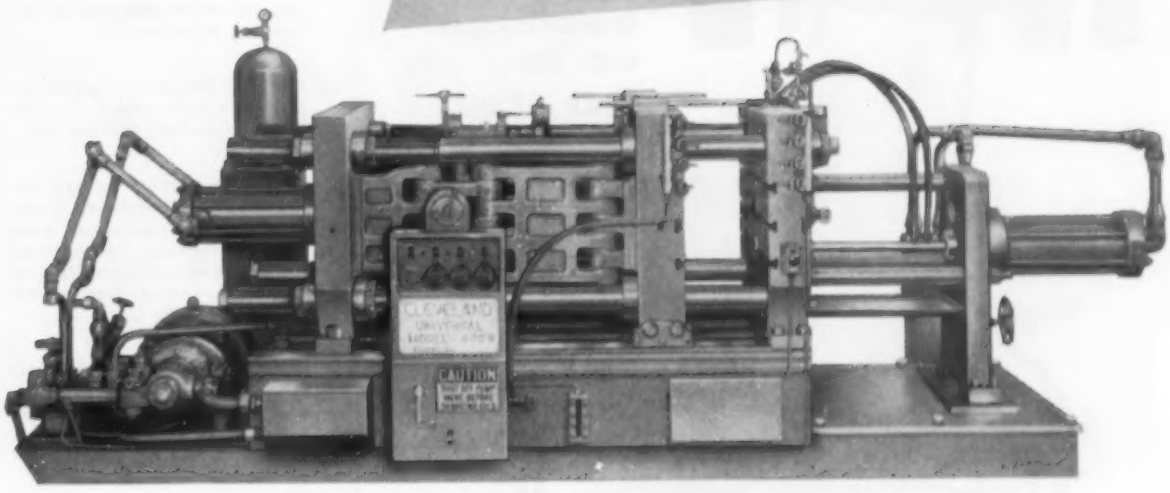
57. BRASS DIE CASTINGS to give all of the advantages of a pressure die casting with brass as the material are described in a 12 page booklet available from Titan Metal Mfg. Co.

Continued on page 18

Meets *ALL* your requirements

for *PROFITABLE* die casting!

Cleveland Model 400-N
shown with cold chamber end.



The CLEVELAND model 400-N
Hydraulic Universal Die Casting Machine

Here are the features of the Cleveland Model 400-N that will give you better castings, faster, at less cost:

- Massive, rigid construction throughout for dependable, economical performance.
- Powerful die locking pressure — 400 tons, strain gauge tested.
- Rapid, smooth die closing and opening for high production operation.
- High metal injection speeds to produce sound, dense, hardware finish castings.
- Safe, simple control—manual or automatic.
- Ample room for die mounting, for operation and maintenance.
- Universal construction — easily convertible for either hot or cold chamber operation.

To get the most from your die casting department —in speed of production and quality of castings —investigate the many advantages of the Model 400-N Cleveland. Let the Cleveland sales engineer in your area show you how the Model 400-N can improve your die casting production with money saved . . . or write direct for full details.

REMEMBER, CLEVELANDS CUT COSTS

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4952 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

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NOW

...a larger furnace to produce investment castings up to 20 lbs.

Here's the new, larger, direct casting furnace, for investment castings up to 20 pounds. It has all the features and advantages of Detroit Electric's successful, 10-pound IC furnace, which is producing high quality castings for many exacting uses.

The new ID Furnace features fast, indirect arc melting. Metal analysis is maintained without carbon contamination from the electrodes. The mold is clamped to the furnace when metal is ready and the mold is poured simply by inverting the furnace.

Let us tell you the complete story of operation and production advantages of the new ID Furnace. Write or call today.

DETROIT ELECTRIC FURNACE DIVISION

Kuhlman Electric Company • 1070 26th St., Bay City, Mich.

For more information circle No. 37 on the Reader Service Card

DATA IN ADS
continued from page 16

59. BARREL FINISHING by the Abbott method is described in literature from The Abbott Ball Co.

61. AIR MOTORS with the speed and power to drive holes through 1/16 inch steel are described in a new bulletin from the Bellows Co.

62. MULTIPLE DRILLING for economical production is the subject of a new brochure from Ettco Tool Co., Inc.

63. THREADED INSERTS to provide strong, wear-resistant threads in nonferrous metals, plastics and other structural materials are described and all necessary engineering data given in the latest specification sheets from the Groov-Pin Corp.

64. CLEANING & BARREL TUMBLING compounds materials as well as the balance of the complete line are described in the latest complete catalog from the Frederick Gumm Chemical Co., Inc.

66. BARREL FINISHING by the Honite methods is discussed in a new engineering report from Minnesota Mining & Mfg. Co.

67. MACHINE DEBURRING of inaccessible and elliptical holes can be done with Nobur tools. A complete catalog of these special tools is available from Nobur Mfg. Co.

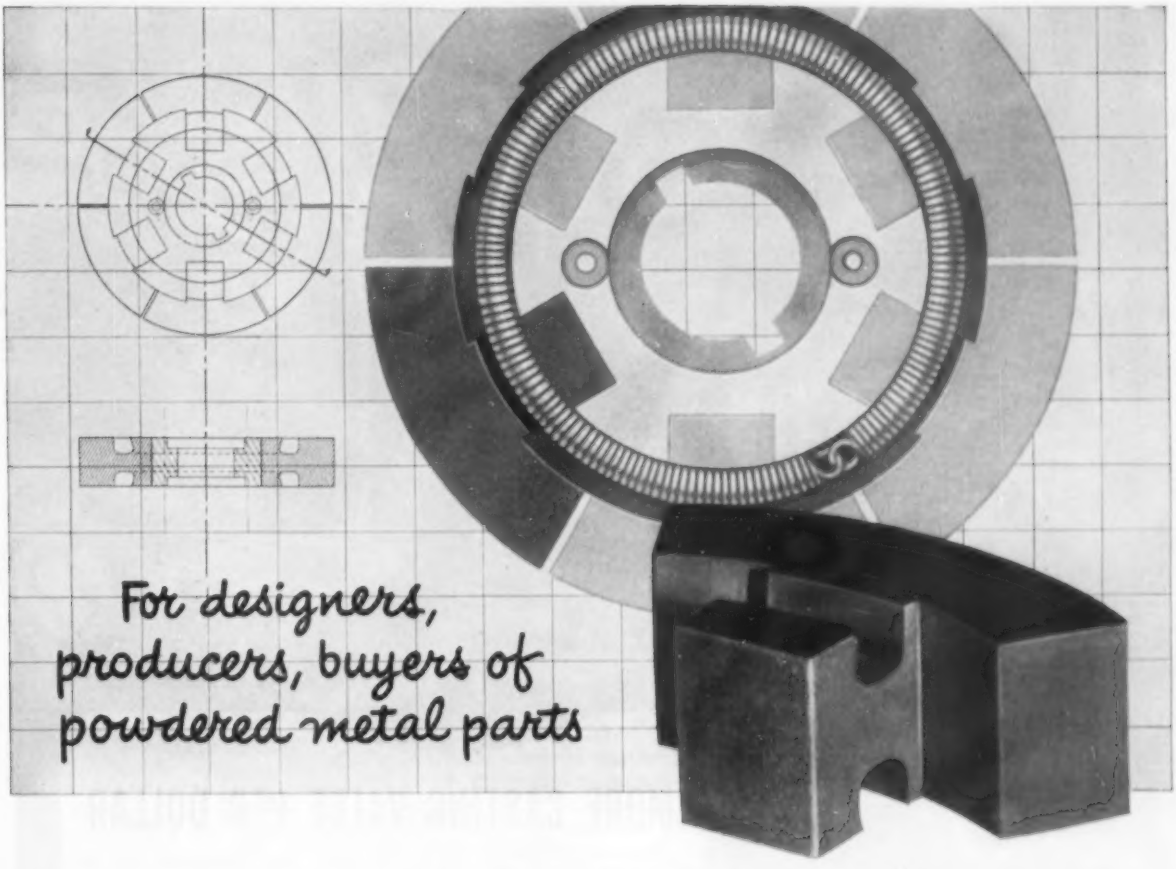
69. CLEANERS FOR ELECTROPLATING are described in a group of four brochures that have been issued by Oakite Products, Inc.

70. DEBURRING, SURFACE FINISHING and other metal removal and surface improvement operations can be done with blast cleaning. Bulletin 1403, from the Pangborn Corp., describes this type of equipment.

72. PRECISE TOLERANCES maintained during barrel finishing with the Roto-Finish methods and equipment. A complete catalog is available describing equipment, supplies and methods from the Roto-Finish Co.

73. ELIMINATE POROSITY and scrap castings by impregnation. A new brochure from Western Sealant Co. describes methods and materials.

Continued on page 53



Republic Iron Powder offers these advantages

FOR DESIGNERS—Republic Iron Powder has good green and sintered strength to aid you in attaining design goals of projected or production items. Uniform shrinkage and growth characteristics help you in die design and in establishing the finish dimension of parts.

FOR PRODUCERS—Republic Iron Powder is uniformly consistent in lot after lot. High green and sintered strength and lower briquetting pressures reduce your processing and handling problems. Republic's hydrogen reduction process has established acceptable limits on flow rate, hydrogen loss and chemical analysis. Particle size distribution and apparent density are carefully controlled.

FOR BUYERS—Republic is working closely with many leading producers of iron powder parts—exchanging ideas and information on how to make parts faster, more uniform and at minimum cost. And, how to make complicated shapes which are difficult to produce economically by other methods. We shall be happy to share this wealth of information with you or put you in touch with these fabricators.

So, whatever your requirements—designing, production or buying—Republic Iron Powder can help you. Our metallurgists and engineers are available for consultation without obligation. Just send the coupon.

REPUBLIC

STEEL

World's Widest Range
of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-1763
3192 East 45th Street
Cleveland 27, Ohio

☐ Please send more information on Iron Powder.
☐ Have an engineer call.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

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MORE CASTING VALUE PER DOLLAR

Monarch pioneered mechanized methods assure casting volume that will meet your highest requirements. Cost savings can be obtained from the first castings produced. Monarch's staff of skilled technicians are trained in every phase of metal-working production to achieve these results.

This invaluable experience is at your service. Start your cost reduction program now, before freezing your final product design. Call on Monarch for the "7 Way" analysis on your present casting requirements, or the new products you are developing for mass production.

MONARCH
ALUMINUM
PIONEERS IN CASTING PROGRESS

MONARCH ALUMINUM MFG. COMPANY
9205 Detroit Avenue, Cleveland 2, Ohio

MANUFACTURERS OF *Aluminum Permanent Mold Castings • Zinc Die Castings • Aluminum Die Castings*
Exclusive Velvaglaze Finishing • Vitreous Enamel Finishing — MEMBERS: CERTIFIED ZINC PLAN • AMERICAN DIE CASTING INSTITUTE

For more information circle No. 45 on the Reader Service Card

INVESTMENT CASTING INFORMATION

In your February issue you had an article by E. L. White, Jr. relative to "investment castings." I would appreciate it if you could tell me where I might be able to get more literature on this type of molding so that I have a better viewpoint as to size of castings, cost of pattern equipment, and cost of castings; and what types of materials can be molded by this process.

We are starting the manufacturing of a new type of equipment which I think lends itself to this type of molding. The materials we are thinking of are cast iron, stainless steel and stellite.

Anything you might do to enlighten me on this product would be greatly appreciated.—A.H.H.

Tear sheets of many articles that have appeared in PMM have been forwarded. We also believe you will find Wood and Von Ludwig's book "Investment Casting for Engineers" to be most helpful. However, recommendations concerning the practicality of producing any piece as an investment casting can only be determined after examining the design of the piece; generalizations without seeing the components can be dangerous and misleading. Cost of pieces and cost of tooling, likewise, must be determined with regard to specific pieces. Therefore, we have asked some of the experienced investment casters in your area to give you the benefit of their opinions on your proposed castings. — Ed.

BONDING ALUMINUM TO IRON

In your March 1956 issue of Precision Metal Molding you describe a process to bond aluminum to stainless steel. On page 44 you mention the Al-Fin bonding process, and also mention the Al-Fin Division, Fairchild Engine and Airplane Corporation. I believe I can use this process in my place and would like to get in touch with the patent owner, and

Continued on page 24

Titan
brass pressure die castings

- cut fabrication costs
- simplify secondary machining
- are made in complex shapes
- have consistent uniformity
- allow large weight savings
- increase production rates

A pioneer in manufacture of brass pressure die castings, Titan can supply these parts to meet your requirements. Little or no secondary machining operation is needed on Titan pressure die castings. Intricate shapes and deep cored holes are readily produced, are consistently uniform. To save weight, wall sections as thin as .070 inches are generally feasible; but 1/32 inch section is possible if not too large in area. Machine scrap is reduced, and your fabrication costs cut. Moreover, the better surface finish, sharper outlines, greater accuracy, higher strength, and finer grain structure of Titan brass pressure die castings make them unquestionably superior to sand and other types of castings.

Anyone of these versatile advantages may be reason enough to specify Titan brass pressure die castings as components in your finished product. Find out what Titan can do for you.

Send for 12-page booklet on Titan brass pressure die castings

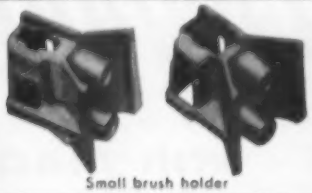
Titan®

METAL MANUFACTURING CO.
BELLEFONTE, PA.
Offices and Agencies in Principal Cities
RODS • FORGINGS • DIE CASTINGS
WELDING RODS • WIRE

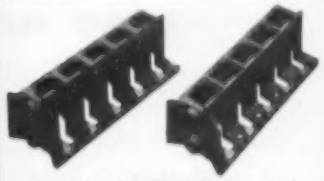
VISUAL PROOF

These photos demonstrate how little secondary machining is required on typical Titan pressure die castings. In each case a part as cast and trimmed only, and the same part machined are shown.

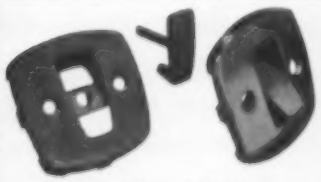
Flywheel for garbage disposal unit



Small brush holder



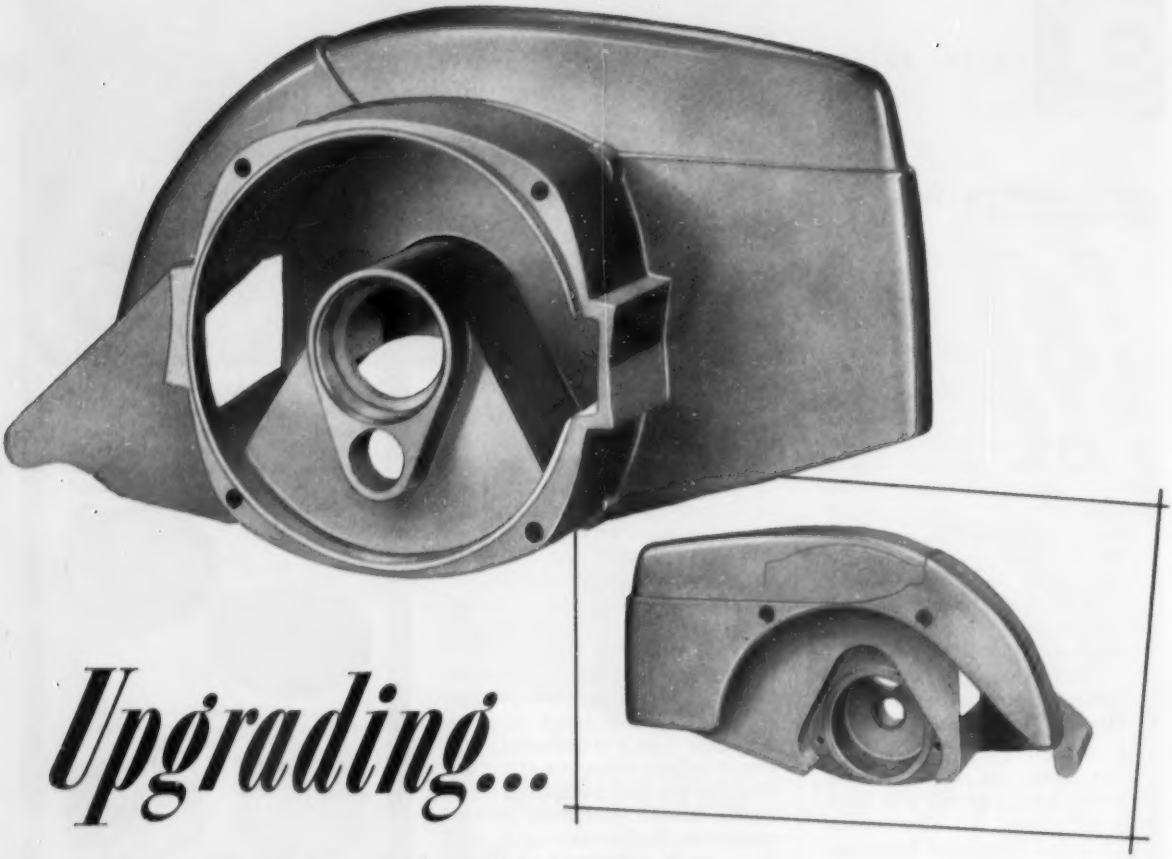
Large brush holder with broached holes held to close tolerance



Overflow plate and trip handle

Shower head

For more information circle No. 57 on the Reader Service Card



Upgrading...

with MADISON-KIPP zinc and aluminum die castings

Die casting as a process, has many inherent advantages in providing lightness, strength and stability in parts that can be cast to dimensions requiring a minimum of machining. These advantages have greatly assisted in upgrading many mass-produced products from automobiles to toys.

To get maximum process utilization, the seasoned and skilled mechanics at Madison-Kipp have proved very helpful to highly placed engineers and designers for over a quarter of a century.

Please clip this ad as a reminder to contact us when you have die casting requirements.

kipp

MADISON-KIPP CORPORATION
213 WAUBESA STREET • MADISON 10, WIS., U.S.A.

• Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

For more information circle No. 42 on the Reader Service Card

now...

LINDBERG-

FISHER

Electric

RESISTANCE

FURNACE WITH...

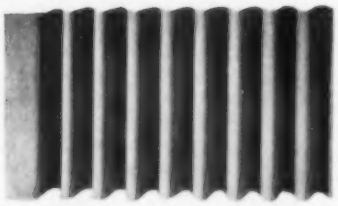
CORRTHERM

HEATING ELEMENT

For permanent mold, sand casting, and die casting of aluminum, magnesium, zinc and lead, Lindberg-Fisher now offers its improved Electric Resistance Furnace with the revolutionary new CORRTHERM Heating Element.

Lindberg-Fisher ER Furnaces have, time and again, meant lower cost per lb. of finished casting. And with practically indestructible CORRTHERM elements, lower furnace maintenance costs and longer crucible or pot service assure you of even greater savings.

These furnaces eliminate localized heating of metal, and gas absorption, because no products of combustion are present. No exhaust fumes or smoke means less operator fatigue and higher production. Investigate the advantages of this furnace. Write for Bulletin No. 321.



CORRTHERM elements are large sheets of nickel chromium. They are easy to install, just hang in furnace, and operate at extremely low voltages, completely eliminating shock or short hazards.

See the Lindberg-Fisher Electric Resistance Furnace in operation at the Casting Congress and Exhibit in Atlantic City. We'll also be showing the new Lindberg-Fisher Electric Reverbatory Holding Furnace and Automatic Ladling Unit.

LINDBERG FISHER

MELTING FURNACES

A Division of Lindberg Engineering Company

2463 WEST HUBBARD STREET, CHICAGO 12, ILLINOIS

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Mossberg had 5 REASONS for using . . .

4 HITCHINER INVESTMENT CASTINGS in this new shotgun*. . .

1. PRICE: These four intricately shaped parts could not be machined within cost budgets. HITCHINER Investment Castings were well within the budget allowed.

2. STRENGTH: If machined, choice of metals was limited to those easily worked. HITCHINER Investment Castings requiring little or no machining, offered a wide variety of alloys permitting greater strength at no additional cost.

3. TIME: Production speed was essential in introducing the new gun. HITCHINER, by using comparatively inexpensive one-cavity dies for the original run, helped get the gun on the market on schedule. Later, multiple-cavity dies were used.

4. DESIGN: The four key parts as designed posed difficult manufacturing problems. The HITCHINER Investment Casting process permitted wide latitude in contour and form.

5. APPEARANCE: Obviously components must maintain the appearance of quality in any quality product. HITCHINER produced accurate parts attractive in appearance without extra work or cost.

These are reasons why so many use HITCHINER Investment Castings to solve small parts problems in both small and large production runs . . . send us your drawings and all pertinent data.

A 12 page booklet covering cost, design, application and manufacture of HITCHINER Investment Castings is yours for the asking . . . send for it TODAY.

*The gun is one of the new No. 200 series Pump Action Shotguns manufactured by O. F. Mossberg and Sons, Inc., 998 St. John's St., New Haven 5, Connecticut.

HITCHINER
Manufacturing Company
MILFORD 7, NEW HAMPSHIRE
REPRESENTATIVES IN PRINCIPAL CITIES

For more information circle No. 31 on the Reader Service Card

LETTERS
continued from page 21

would also like to get the address of the Fairchild Engine and Airplane Corp. H.B.

Address of Fairchild, who are owners of the patents, has been forwarded. Many new uses are cropping up for this method of producing a permanent bond between aluminum and ferrous metals. — Ed.

DANGER OF CONTAMINATION

I was very much disturbed about the article concerning the Fisher Gauge Wks. Ltd. method of assembling small parts by die casting. What disturbed me naturally was the mention of the use of low melting alloys based on lead, tin, and possibly the common type metal alloys or tin-antimony alloys. In any process, rejects are inevitable and I don't have to tell you about the dangers of contamination, particularly if the components being assembled were zinc die castings and the joining metal is of either a tin or lead base.—C.R.M.

The Fisher machine is rarely used for assembling die castings, but was originally designed for, and so far, has found its principal use for the assembly of small stamped gears on screw machine shafts. It is a bench assembly type of unit not designed for use in a die casting plant. In those applications where the assembly of a die casting to another component might be required, the Fisher unit can be used to cast zinc.

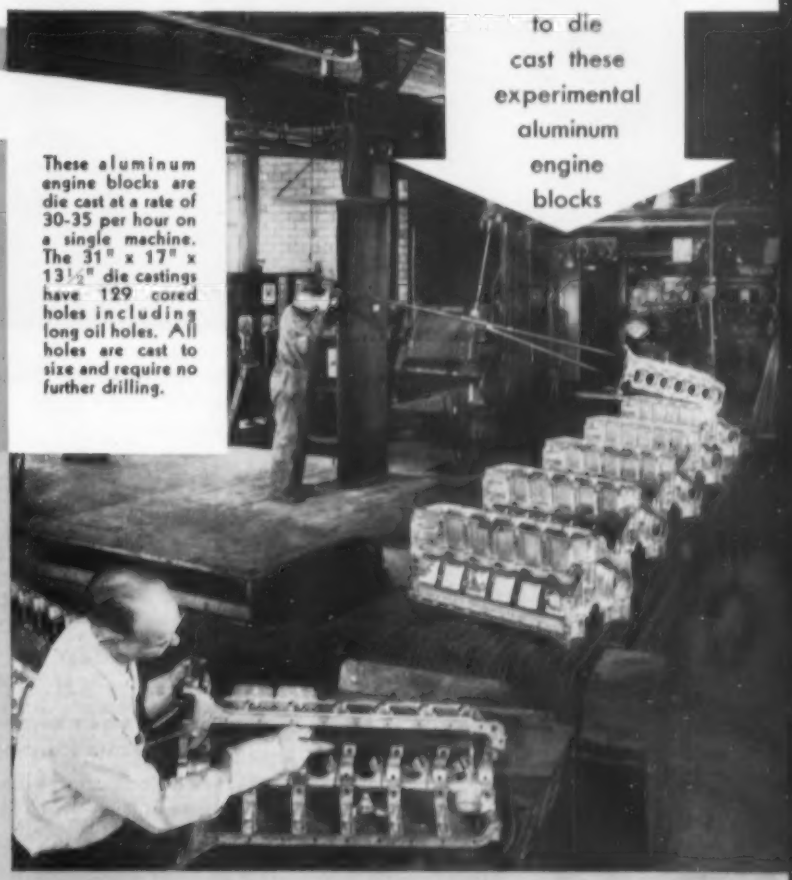
However, it is well to point out the extreme hazard of tin, lead or antimony in zinc die castings. These are the main culprits against which the present close limits on alloy composition have been developed. A small piece of solder or a particle of tin coating material which gets into a zinc pot by mistake will ruin the entire melt. Needless to say, any assembly in which a tin or lead alloy is used should never be allowed to get in with die cast scrap for remelting.—Ed.

Latrobe's VDC

DIE CASTING DIE STEEL *used by*

Doehler-Jarvis Division
National Lead Company Toledo, Ohio

to die cast these experimental aluminum engine blocks



These aluminum engine blocks are die cast at a rate of 30-35 per hour on a single machine. The 31" x 17" x 13½" die castings have 129 cored holes including long oil holes. All holes are cast to size and require no further drilling.

Here's why leading die-casters choose VDC for intricate dies . . .

VDC has sound structure and freedom from porosity—important factors when sinking die cavities.

Long production runs obtained with VDC. Excellent resistance to wash and heat checking.

VDC has superior resistance to size change during heat treatment.

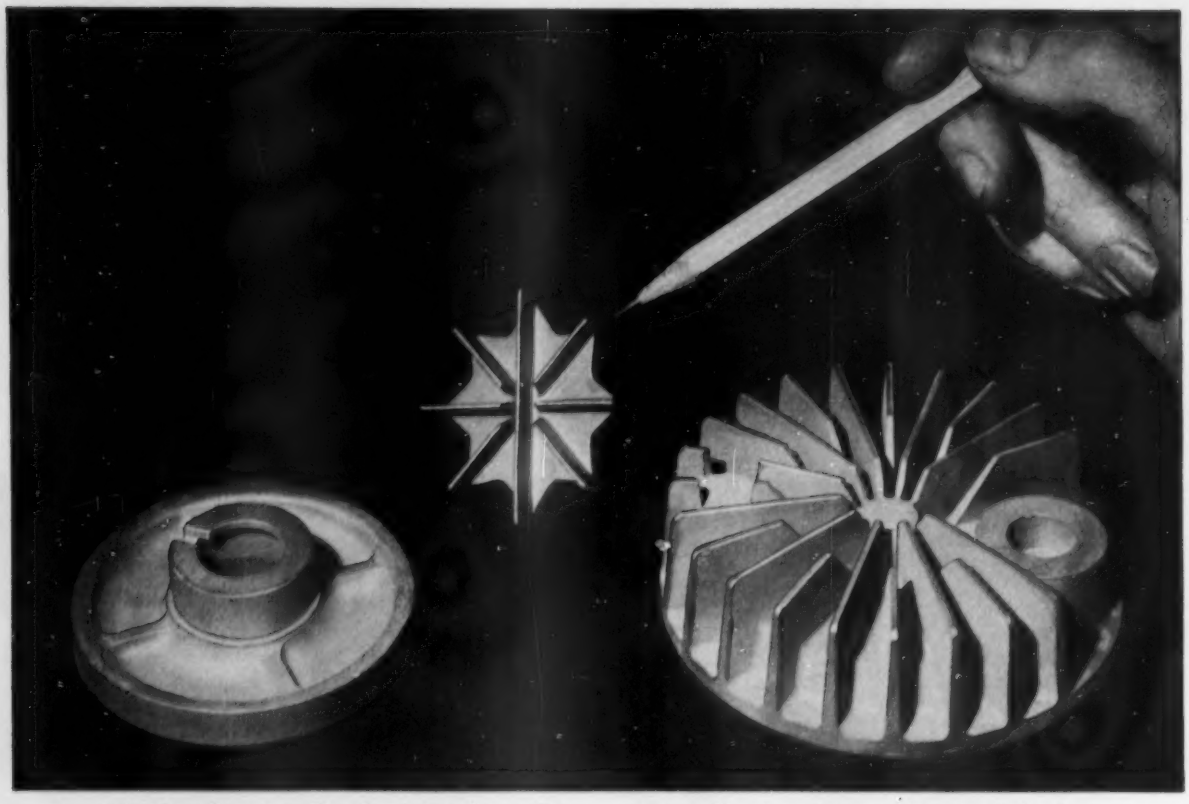
Latrobe's VDC hot work die steel is an air-hardening, 5% chromium die steel especially suited for aluminum, zinc, and magnesium die casting dies. Its high vanadium content increases resistance to wash and heat checking and imparts superior properties at elevated temperatures.
VDC also possesses excellent impact strength, is easy to machine and can be water cooled in service.

For more information circle No. 38 on the Reader Service Card

VDC hot work steel is stocked in a wide range of sizes in Latrobe's conveniently located warehouses. Call your Latrobe representative . . . specify VDC for your next die casting die.

Branch Offices and Warehouses in Principal Cities

LATROBE STEEL COMPANY
Main Office and Plant: Latrobe, Pa.



Spins in salt water—Pencil points to "PITLOC" impeller that spins in salt water at 6000 RPM. All three parts are Monel precision castings made by Inco for Pitometer Log Corporation, New York City.

With Inco Precision Casting, precision-balanced *impeller*

needs no milling, little hand filing

These parts go into a "sea speedometer." It's a Pitometer Log that translates water velocity under a ship into knots. And when you remember how corrosive fast-moving salt water is, you know why the parts are made of Monel* nickel-copper alloy.

For the Monel castings, the people who make "PITLOGS" called on Inco's "know-how" with nickel alloys.

Inco *precision* casting cut machining time 30%

That's a round figure for all three parts. The time-saving is nearer 50% in machining the intricate ribbed cover you see at right. Inco precision casting also enabled "PITLOC" engineers to redesign this part. Reduce its wall thickness. Improve its geometry. Minimize scrap.

Previously, when the center impeller was sand cast, "PITLOC" machinists had to mill the ribs. And they had to hand file the webs between the ribs to balance the impeller. *Inco precision casting eliminated all milling.* It reduced the hand filing appreciably, too.

Where can you save with Inco precision casting?

Do you have a part which is 6 inches by 5 inches or smaller? Does it weigh under 3 pounds? Require starting tolerances as close as plus or minus .005 inch per linear inch? And need 5 or more fabrication steps? If so, there's a good chance you can cut cost and improve design by having the part precision investment cast by Inco.

Inco precision casts most high-melting point alloys from carbon steel to the new super alloys.

*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

5 Advantages of INCO Precision Casting

- Save up to 60% of production costs.
- Longer life with harder alloys.
- Little or no machining required.
- Wider design latitude.
- Higher alloys at lower cost.

Get This Helpful New Booklet

Trying to keep costs in line on some small part? Then write for new 16-page booklet, "Cast to Outlast." Contains many case histories detailing how others cut costs with Inco precision castings. There is a good chance this helpful data will suggest a practical way to cut your costs, too.

Inco Castings

INCO TRADE MARK

Precision • Sand • Centrifugal

For more information circle No. 36 on the Reader Service Card

U.S. PATENTS

Copies of all patents reviewed can be secured from U. S. Patent Office, Dept. of Commerce, Washington, D. C. for 25¢ each.

A METHOD FOR THE PRODUCTION OF metallic titanium in the form of particles, all of which are larger than 325 mesh. The metal is produced in an anhydrous, fused salt bath by electrolysis. Bath composition is such that at least one salt of an alkali metal halide and alkaline earth halide are present. The titanium content, in the form of an alkaline metal fluotitanate, is maintained between 0.5 and 35.0 mol percent. The total impurity content of metals such as aluminum, chromium, iron and vanadium must be less than 0.02%.

(Patent No. 2,731,402—Production of Metallic Titanium— Alfred A. Topinka, Quentin H. McKenna and Stuart S. Carlton—assigned to Horizons Titanium Corp.—issued Jan. 17, 1956—5 claims.)

THE DEPOSITION OF A BRIGHT ZINC plate on metallic objects by using an addition agent to the acid zinc solution selected from the group of selenium or tellurium, the oxides, acids and acid salts of selenium and tellurium, and the sulfur homologs of the oxides, acids and acid salts of selenium and telluriom. The effective concentration of the metal of the selected additive is held between 0.01 and 20 mg. per liter of solution.

(Patent No. 2,729,602—Electrodeposition of Bright Zinc Plate—George Robert Van Houten—issued Jan. 3, 1956—10 claims.)

A PROCESS FOR SURFACE treating aluminum and aluminum alloys by etching the surface with a mixture that is approximately 45 to 98% free phosphoric acid, 2 to 35% water and ½ to 50% free nitric acid. The reaction is carried out at a temperature of from 150F to the boiling point of the mixture. This etch produces a macroscopically uniform smooth finish on the metal.

(Patent No. 2,729,551—Surface Treatment of Aluminum and Its Alloys—Charles C. Cohn—assigned to the Colonial Alloys Co.—issued Jan. 3, 1956—12 claims.)

A NICKEL PLATING PROCESS in which the nickel to be deposited on a metallic body is in the form of nickel carbonyl. The process generates the nickel carbonyl and de-

Continued on page 66

MARVEL Synclinal FILTERS

For Efficient Filtration of—

Hydraulic Oils

Fire Resistant Hydraulic Fluids

Coolants — Lubricants

Water

SUMP TYPE
(cutaway)

OVER 650
Original Equipment Manufacturers install Marvel Synclinal Filters as Standard Equipment

LINE TYPE
(cutaway)

PROTECT EQUIPMENT — INCREASE PRODUCTION — REDUCE MAINTENANCE

Marvel Synclinal Filters installed in the sump or on the line preceding pump offer maximum protection on all hydraulically actuated and other equipment utilizing low pressure circulating oil systems. Maintenance and production costs are reduced because Marvel Synclinal Filters BALANCED design offers greater ACTIVE filtering area with sufficient storage capacity for filtered out damaging particles, thus, longer periods of productive operation are attained at minimum "down time" due to maintenance and repairs.

PRODUCTION ENGINEERS and MAINTENANCE MEN whose job it is to keep production machinery operating at peak efficiency and who have recognized the superiority of Marvel Synclinal Filters in the filtration of hydraulic oils, fire resistant hydraulic fluids, coolants, lubricants, etc. are specifying Marvel Synclinal Filters on all new equipment and standardizing with Marvel Synclinal Filters on all machines within their plants.

Another outstanding reason for their preference is the simple construction of Marvel Synclinal Filters which allows them to be easily disassembled, thoroughly cleaned and reassembled on the spot, by any workman in a matter of minutes. Line type operates in any position and may be serviced without disturbing pipe connections.

A SIZE FOR EVERY NEED

Available for sump or line installation in capacities from 5 to 100 G.P.M. Greater capacities may be attained by multiple installations (as described in catalog). Choice of Monel mesh sizes range from coarse 30 to fine 200.

IMMEDIATE DELIVERY

As in the past, Marvel continues to offer Immediate Delivery!

MARVEL ENGINEERING COMPANY

7227 N. Hamlin Ave., Chicago 45, Ill.
Phone: JUNIPER 8-6023

Catalogs containing complete data available on request

PMM-5

Without obligation, please send me complete data on Marvel Synclinal Filters, as indicated:—

- ☐ Catalog No. 107—For Hydraulic Oils, Coolants and Lubricants
- ☐ Catalog No. 301—For WATER
- ☐ Catalog No. 200—For Fire-resistant hydraulic fluids

Name .....
Title .....
Company .....
Address .....
City .....
State .....

SAMMY INGOT OFFERS EXPERT ADVICE

HERE'S A NEW CASTING JOB THAT'S GOT ME WORRIED, IT'S THE FUSSY, HARD-TO-RUN KIND...
I KNOW WHAT YOU MEAN, THE SPECS SCARED ME TOO WHEN I READ THEM.
FELLOWS - DON'T WASTE TIME WORRYING - CALL SAMUEL GREENFIELD CO. AND ASK THEM TO SEND THEIR FOUNDRY CONSULTANT — OUT HERE!
LOOK FRIEND - WE'RE GOING TO HAVE EXPENSE ENOUGH RUNNING THIS JOB WITHOUT BUYING ADVICE.
BUYING ??? THIS SERVICE COMES FREE
THIS FREE FOUNDRY CONSULTANT AND ENGINEERING CASTING SERVICE IS YOURS - ANYTIME YOU WANT IT.
SIR — WE CERTAINLY APPRECIATED YOUR SHOWING US HOW TO POUR THIS INTRICATE JOB. YOU SAVED OUR SKIN.
THAT'S HIS JOB - AND GREENFIELD'S JOB IS TO SAVE YOU TIME AND MONEY ALL ALONG THE LINE, WHETHER IT'S FREE CONSULTANT SERVICE, OR LOW PRICES ON QUALITY ALUMINUM AND BRASS INGOT. CALL US ANYTIME!

"OUR INGOTS MAKE BETTER CASTINGS"

SAMUEL GREENFIELD ALUMINUM ALLOYS

- Chemically Pure
- Rigidly Supervised and Tested
- Certified Chemical Analysis Furnished

FREE FOUNDRY ENGINEERING CONSULTATION SERVICE

Over 120 years combined experience is yours at no obligation. Write or call . . .

SAMUEL GREENFIELD CO., INC.

HUmboldt 4050

31 Stone St. Buffalo 12, N. Y.

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How SHELL MOLDING with G-E shell resins

CUTS COSTS

for CRUCIBLE STEEL COMPANY OF AMERICA

Ask Crucible Steel about shell molding with General Electric shell resins and you'll get a glowing report on *better castings at lower cost!* For Crucible finds the shell process ideal for casting parts in its new Rexalloy*—a super-hard alloy that's too tough to machine easily, too expensive to waste through machining allowances. Shell-molded Rexalloy parts are often usable as cast—far smoother and sharper than conventional sand castings—much less expensive than investment castings. To obtain these benefits, Crucible uses G-E shell resins, relying on them for batch-after-batch uniformity and properly balanced properties.

*Reg. trademark, Crucible Steel Company of America.

How can shell molding help YOU?

General Electric offers a number of products to help foundrymen get maximum benefits from the shell process: *G-E phenolic shell-molding resins* to form light, dimensionally accurate molds . . . *G-E silicone release agents* to free molds easily from patterns . . . *G-E phenolic bonding resin* to cement shell halves together.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Ask G. E. about shell molding!

General Electric maintains a shell-molding laboratory in Pittsfield, Mass., to help users and prospective users of shell molding solve problems and evaluate the process. G.E. also offers a 28-page manual describing the techniques and benefits of this new foundry method. *Just mail the coupon for a free copy!*

FREE SHELL-MOLDING MANUAL!

General Electric Company
Section 6F3C2
Chemical and Metallurgical Division
Pittsfield, Massachusetts

Please send me a free copy of *G-E Shell Molding Manual.*

( ) We are presently using the shell-molding process.
( ) We are interested in the shell-molding process.

Name _____

Firm _____

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City _____ Zone ____ State ____

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60,000 SQUARE FEET OF MODERN FACILITIES

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Bridgeport Brass

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Gilbert & Barker Mfg. Co.

Greist Mfg.

Remington-Arms

Royal Typewriter

Scovill Mfg.

Stanley Works

Western Electric
Baltimore, Md. Kearny, N. J. Haverhill, Mass.

Westinghouse

Whitney Blake

and others...

Such patronage must be deserved

THE NEW ENGLAND DIE CASTING CO.

445 Front Ave. West Haven, Conn. • P. O. Box 1281 New Haven Conn.

For more information circle No. 46 on the Reader Service Card

How Burroughs Cut 9 Steps To 2

WITH more than a half million type bars to manufacture each year for their Series F adding machines, Burroughs Corp. decided to find a production method less costly than the old-fashioned kneading of characters into a strip of steel. They felt that this technique was not in keeping with other up-to-date methods the company is using.

Their solution for this problem has been to substitute a zinc die casting, with a steel insert for stiffening, and the results have been most impressive. They saved enough on the redesigned type bars to pay off the initial tooling investment in five months.

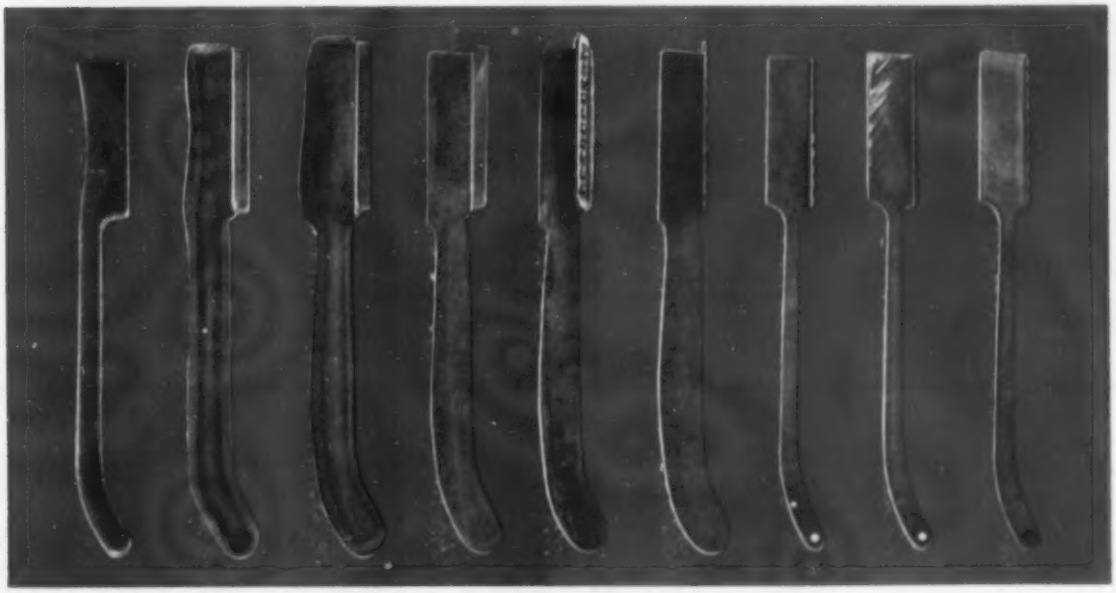
The old method of type bar manufacture cost them about $125,000 per year. The die castings are responsible for slashing this annual figure to $61,000 . . . a saving on finished piece costs of about $64,000.

But, in addition, savings have also been realized in the reduction of matrices needed for type and in the elimination of maintenance costs required to keep the kneading machines, trim dies, etc., in good shape. Add this to the basic savings on pieces, and *the total estimated savings accomplished through use of zinc die castings comes to $82,099 annually.*

Formerly the type bars were made by kneading type into a steel bar. Nine steps required include two swages, three trimmings, kneading, perforation, assembly and hardening, plating, and final assembly.

Today, the steel blanks are assembled in a six cavity die cast mold. The type faces are next die cast onto the steel blanks. The castings are then burred and cleaned, the bar assembled and rod parts are riveted. As a final step the bars are racked and dull chrome plated.

NEW Savings of more than $80,000 a year have been made by using this two-step process. Steel blanks, left, are inserted in a six-cavity die and the type is die cast onto it. The bars are then burred and cleaned, assembled, and rod parts riveted. Finished bar is shown at right.



OLD Steps in the process were, left to right: 1) Blank, 2) First swage, 3) Second swage, 4) First trim, 5) Knead, 6) Second trim, 7) Third trim and perforation, 8) First assembly and hardening, 9) Plating and final assembly.

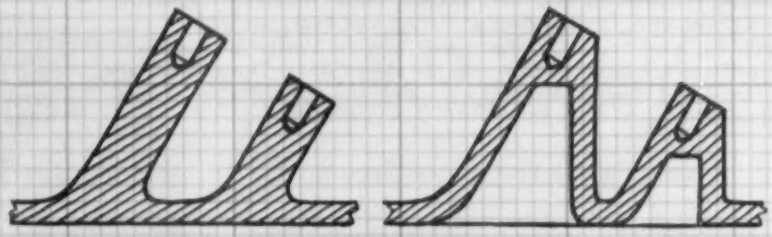
Design Pointers
FOR DIE CASTINGS

MONEY SAVERS

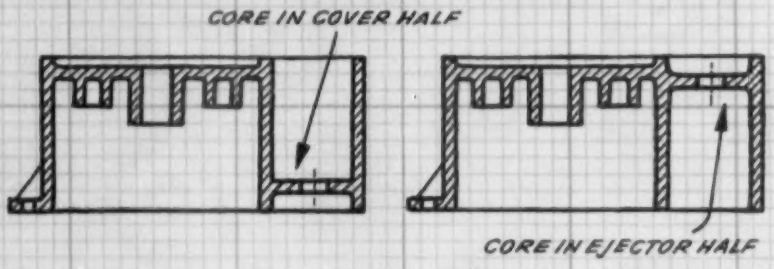
HERE are some more practical tips to help you with your designs for die castings. They may save you money, improve your product, speed up production, or simply help you and your die caster to understand each other more easily. Your die caster can help you to detail your designs for optimum production.

UNDESIRABLE | DESIRABLE

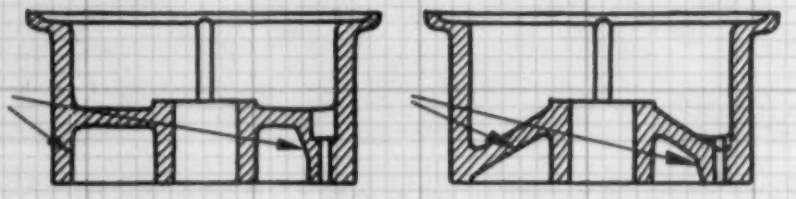
Sloping bosses can be designed for straight die parting to avoid expensive die construction.



Deep cavities should all be on one side of casting where possible.

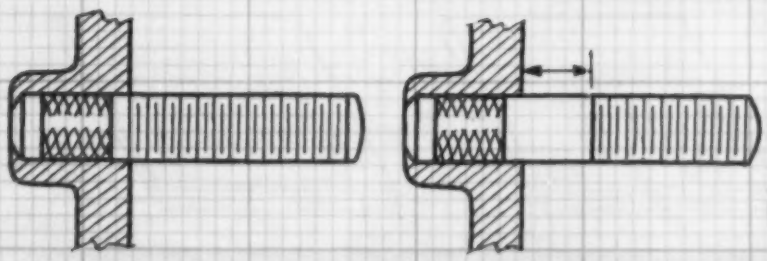


Cavities can often be modified to eliminate binding due to shrinkage over cores.

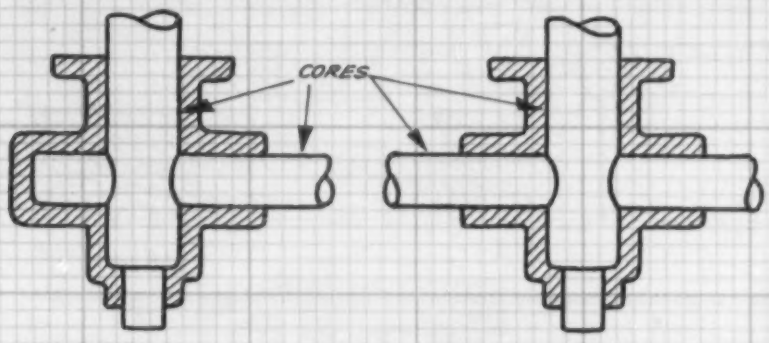


UNDESIRABLE

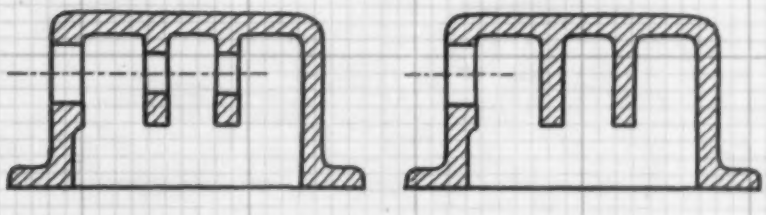
DESIRABLE



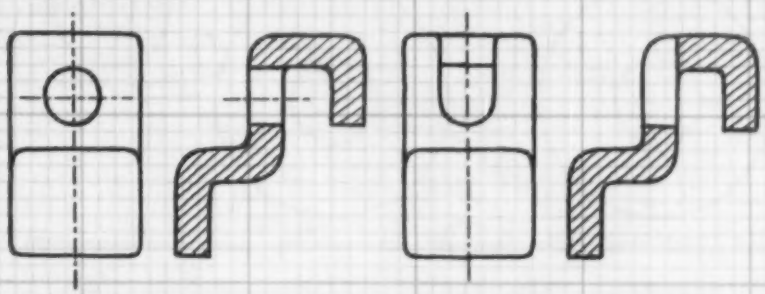
To prevent flash in threads of inserts, leave space between surface of casting and the threads.



Interlocking cores are rarely justified. Preferred design... two small cores bearing against a larger core.



Avoid moving cores that must fit accurately in both die halves. Drill holes in inner brackets.



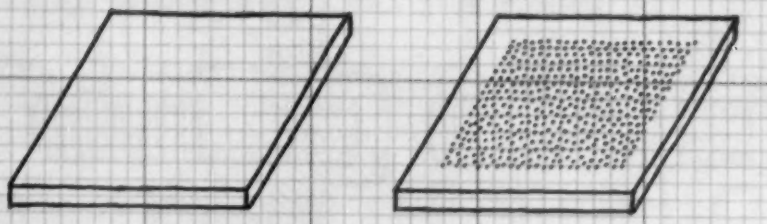
Side cores can often be avoided by this hole design.

Raised lettering is simple to cut into the die, depressed lettering can be produced but costs more.

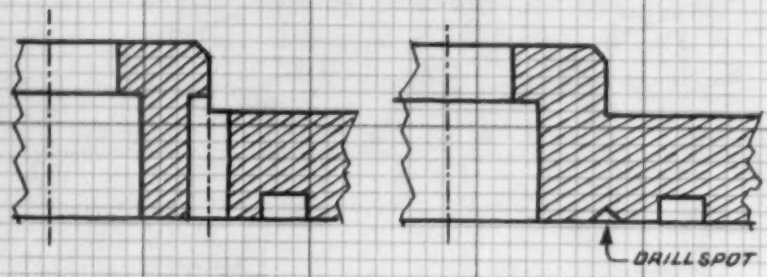
UNDESIRABLE

DESIRABLE

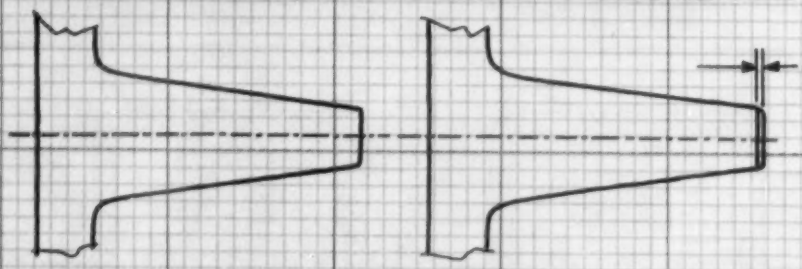
Avoid large, plain surfaces. Where possible, break up areas with ribs, serrations, stippling, etc.



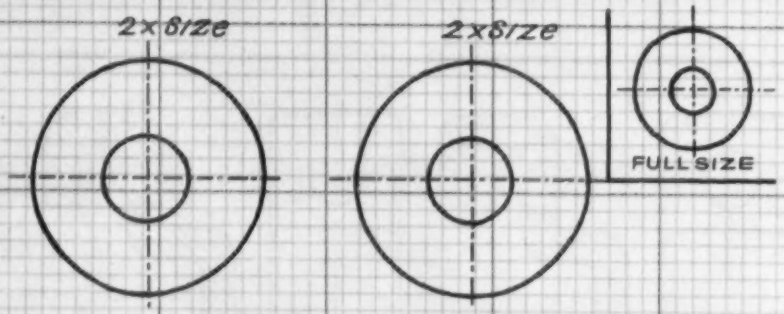
Casting drill spots is often preferred to attempting to core a through hole. Offhand drilling from a spot is simple.



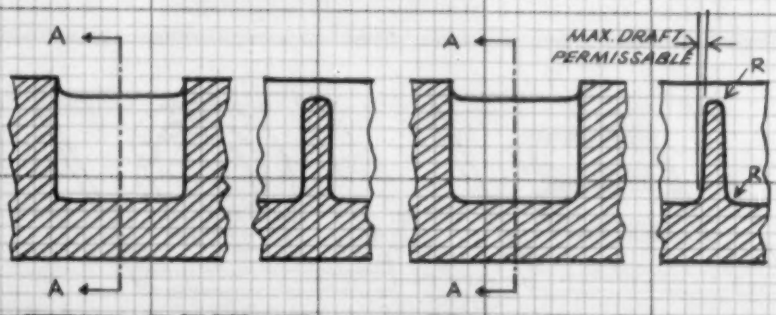
Extra stock should be allowed for machining ejector or vent marks from deep sections.



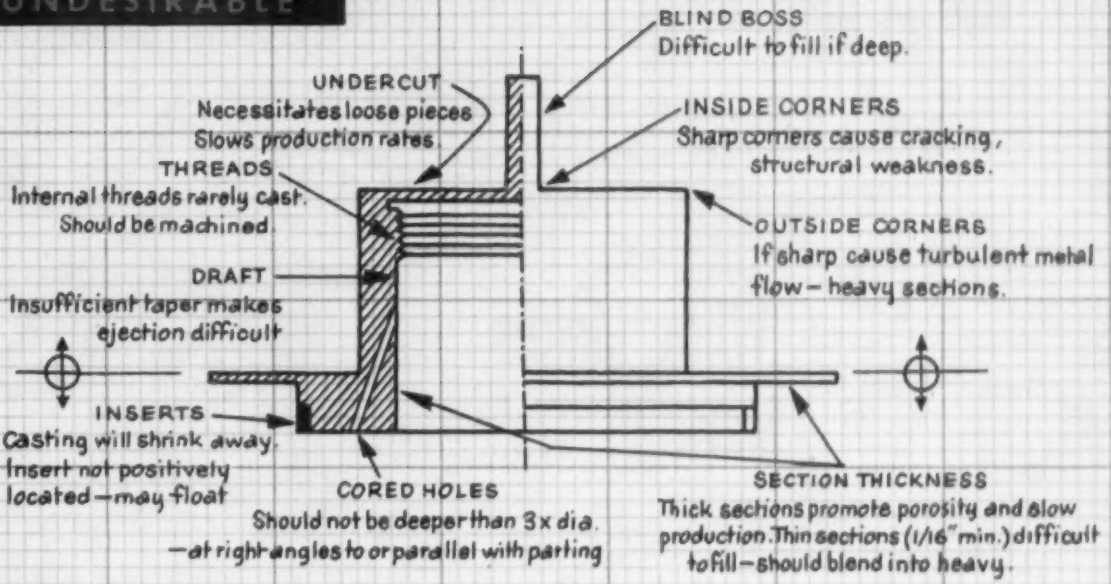
In drawing it is desirable to have a full size view, as well as an enlarged view.



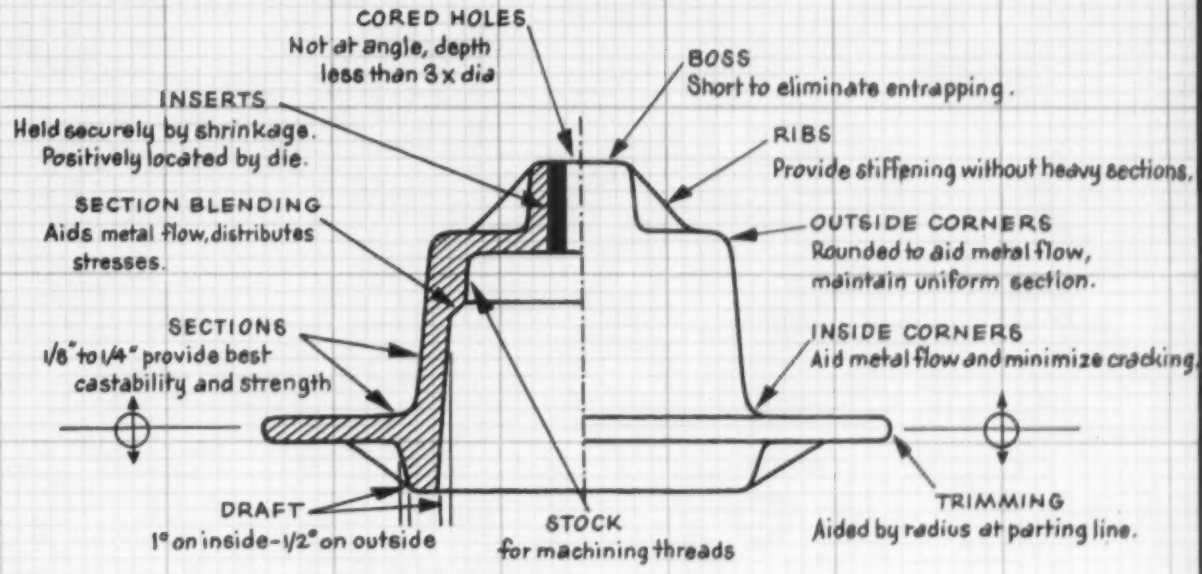
Easier ejection of deep ribs is permitted by providing maximum draft.



UNDESIRABLE



DESIRABLE



DRAFTING PRACTICE

Desirable practice requires the following information:

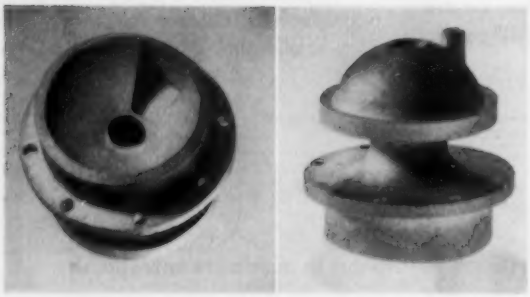
1. *Draft allowance*
2. *Ejector Pin marks raised or depressed*
3. *Tolerances*
4. *Part number location & size*

THANKS ARE DUE TO: Aluminum Company of America, Cleveland Hardware & Forging Co., Bendix Foundry, Federal Die Casting Co., Gries Reproducer Corp., The Hoover Co., Litemetal Dicast Inc., Monarch Aluminum Mfg. Co., and New Jersey Zinc Co.

INVESTMENT CASTINGS

This artificial man with investment cast cervical vertebrae will never get a crick in his neck

What Makes Mark III Tick



NECK BONES produced by investment casting are shown from two angles at the top, while the complete skeleton of Mark III test dummy is below.

REALISM is the goal of engineers who have created this test dummy for use in auto and aircraft safety research.

WITH metal bones and foam plastic flesh, a new type of man has been created for use in aircraft and automotive safety research. Known to his friends as Mark III (his full name is Mark III Anthropomorphic Test Dummy), he provides a great deal of physical data about what happens to the human system in crashes and other occurrences too dangerous for human participation.

Mark III is not built to be destroyed, but is chuck full of instruments such as accelerometers, gyros and recorders to measure and report the effect of outside forces upon human structures. He is designed to reproduce human proportions, weight distribution, articulation, resilience and other characteristics.

In constructing this test dummy, engineers at Alderson Research Laboratories who designed and built him found that the most practical way to make the cervical vertebrae is investment casting.

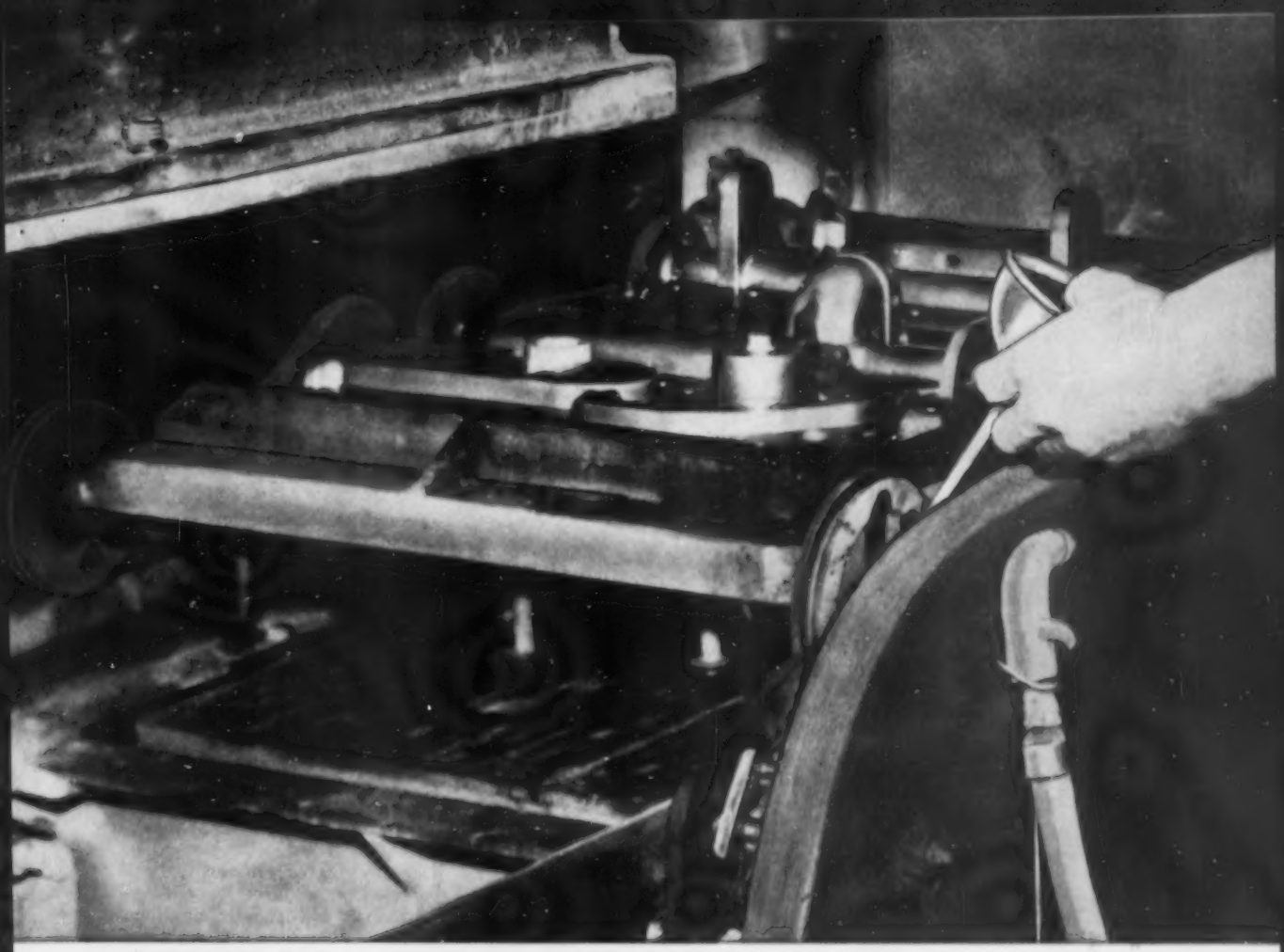
The several vertebrae are formed to fit together in a modified ball and socket relationship. Motion is controlled within naturalistic limits by means of a boss projecting from the hemispherical top surface of one casting, fitting into a radial slot on the underside of the mating casting.

Produced by the Investment Casting Co., Springfield, N. J., these castings have helped establish proper neck articulation and responses.

Data obtained from the test dummy, whose responses are as near those of humans as possible, are correlated with other physiological information to permit forecasting probable consequences to human beings in similar circumstances.

Realism has been a major objective . . . the metal skeleton simulates the wide range of human motions, and the flesh, molded from vinyl plastisol foam, has about the firmness or softness of human flesh in a state of moderate muscular tension.

For more information circle No. 3 on the Reader Service Card ⟶



'dag' dispersions . . . *a touch does so much!*

'Oildag' vital to continuous molding-machine operation

Production Pattern & Foundry Company of Chicopee, Mass. runs its five shell-molding machines 24 hours a day to keep up with casting-floor demand for molds. To stand up under this tough service, the machines must be properly maintained.

Maintenance personnel at Production Pattern & Foundry have found that lubrication instructions of the machine's manufacturer have paid off handsomely. Shell Process Co., which makes these shell-molding machines, recommends **'Oildag'** — colloidal graphite in petroleum oil — diluted with five parts of No. 10 oil for the lubrication of critical wear points: the axle bearings of the drive mechanism, and hitch-pivots and link pins of the roller chain. Since the roller chain is subjected to 900° F temperatures within the shell-baking oven, conventional lubricants would be useless . . . would decompose and carbonize. Proof of the effectiveness of colloidal graphite for this heavy-duty high-temperature lubrication job is the fact that the machines have operated without breakdown for more than six years!

Dispersions of colloidal graphite are extremely valuable elsewhere in the foundry too: as long-lasting lubricants for moving parts of casting machines and other foundry mechanisms; as heat-resistant ladle coatings, and effective mold coatings for better parting and controlled cooling. You can learn more about the use of **'dag'** dispersions in metal-casting operations through Acheson's Bulletin 425. Write for your free copy today.

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TITANIUM SPONGE can be consolidated by special powder metallurgy techniques, although arc melting is widely used by industry for large tonnage consolidation.

Titanium offers many desirable properties for product design, but fabrication is still a problem. Here is a report on one important method . . .

Titanium Powder

by R. F. BUNSHAH*, H. MARGOLIN**, and I. B. CADOFF***

THE total output of mill products of titanium for 1955 has been estimated by Thomas Lippert of Titanium Metals Corp. to be 1900 tons at a value of about $60,000,000. He further predicts that the output of mill products during 1956 will reach 4,000 to 4,500 tons.

The burgeoning interest in titanium is a result of its corrosion resistance, favorable strength-to-weight ratio and abundance. The presently increasing use of titanium can be associated with solution of technical problems relative to hydrogen contamination, increased homogeneity of alloys and the development of an alloy containing 6 percent aluminum and 4 percent vanadium which is gaining wide acceptance.

Titanium at present is primarily used for military purposes, principally aircraft. In aircraft, titanium is being used in jet engines, as skins and stiffeners, fire walls and exhaust shrouds. It is anticipated that titanium will be used extensively in air frames, i.e., in wings, tail and fuelage, and that as much as 75 percent of some jet aircraft will consist of titanium. Present non-military uses, however, account for only about ten percent of titanium mill-product output.

The discovery of titanium as an element by Gregor dates back to the last decade of the 18th century. In that same decade it was given the name titanium by the German chemist Klaproth. However it was not until 1910 that M. A. Hunter in this country produced titanium with sufficient purity that it could be made malleable at elevated temperatures. A. E. Van Arkel and J. H. de Boer, using Hunter process titanium as a starting material, in 1925 produced high-purity titanium by decomposition of titanium tetraiodide and subsequently studied the properties of this material.

However, the commercial development of titanium became feasible only when W. J. Kroll in 1940 developed the process which bears his name, in which titanium tetrachloride is reduced to the highly ductile metal by reaction with magnesium. The metal so produced contains as major impurities iron, magnesium chloride, oxygen and nitrogen.

The greatest development of the titanium industry has taken place in this country, principally through government stimulation. The first impetus came in 1946 as a result of exploratory work on the preparation, fabrication and properties of Kroll process titanium carried out by Dean, Whartman, Long, Anderson and Hayes of the Bureau of Mines.

The product of the Kroll process is a spongy material, as shown above, which must be consolidated before it can be used. Special consolidation techniques must be employed because titanium is so highly reactive. It reacts with oxygen and nitrogen, becoming very brittle, and so cannot be melted in air. Melting under atmosphere in a refractory crucible also produces embrittled titanium because of reaction with the crucible material.

Dean and his associates chose powder metallurgy techniques for consolidation of the sponge and obtained properties in titanium sheet which are comparable to those obtained in present-day commercially pure titanium, that is, a tensile strength of 82,000 psi and elongation of 28 percent in two inches. However, the development of arc melting on a

*Associate Engineering Scientist, New York University; **Head, Physical and Structural Metallurgy Section, Metallurgy Laboratory, N.Y.U., ***Assistant Professor, and Head of Solid Technology Group, N.Y.U.

Metallurgy

THIS MONTH — Present status of titanium powder.
NEXT MONTH — How to fabricate titanium powder.
JULY PMM — Design factors, properties, uses.

water-cooled copper hearth provided the means by which tonnage consolidation of titanium could be achieved, and this method has been adopted by industry.

Following this early study by the Bureau of Mines, extensive alloy development work was carried out by several groups. Battelle Memorial Institute published in 1950 a survey of the influence of various elements on the mechanical properties of titanium. As a result of this survey and other subsequent investigations a number of alloying elements were found to have promise for use with titanium. These are vanadium, molybdenum, iron, chromium, manganese, aluminum and tin. The elements are usually added in groups and it may safely be said that aluminum is and will be present in a majority of the commercially important alloys.

Titanium exhibits two structure types, the high-temperature form, beta, which has a body-centered cubic structure and exists above 1620 F (882 C) and alpha, the low-temperature hexagonal close-packed modification, to which beta transforms below this temperature. With the exception of aluminum and tin all of the alloying agents indicated above dissolve to a greater extent in the beta phase than in alpha. Aluminum and tin have greater solubility in the alpha phase.

With the development of promising alloys it was necessary to develop a number of phase diagrams in order to understand how to heat treat the alloys. It was found that the alloys which dissolve preferentially in the beta phase lower the transformation temperature, whereas those which dissolve preferentially in alpha raise the transformation temperature. Elements like iron, chromium, manganese, vanadium and molybdenum, which lower the transformation temperature, are known as beta stabilizers. Those like aluminum, oxygen, nitrogen and carbon, which raise the transformation temperature, are known as alpha stabilizers.

It has been found that when sufficient beta stabilizer is present the beta phase can be retained at room temperature by quenching. If the beta stabilizer content is greater than this critical amount beta can be retained at cooling rates slower than water quenching. Thus it is possible to heat an alloy in the alpha-beta field at a temperature where the alloy content of beta is sufficient to retain the beta phase and produce an alloy containing both the alpha and beta forms of titanium at room temperature. High-strength titanium alloys have been produced with this type of treatment. Typical of commercially available alpha-beta alloys are listed in Table 1.

As marketed, the tensile strengths of these alloys lie in the range 130-160,000 psi. Investigation has shown that the beta phase is heat treatable and may be age hardened in a manner similar to that carried out for aluminum base alloys. In laboratory work, alpha-beta alloys have been heat treated to strengths of 200-225,000 psi with adequate ductility. At the present time commercial use is not being made

Continued next page

TABLE 1: Typical commercially available alpha-beta titanium alloys

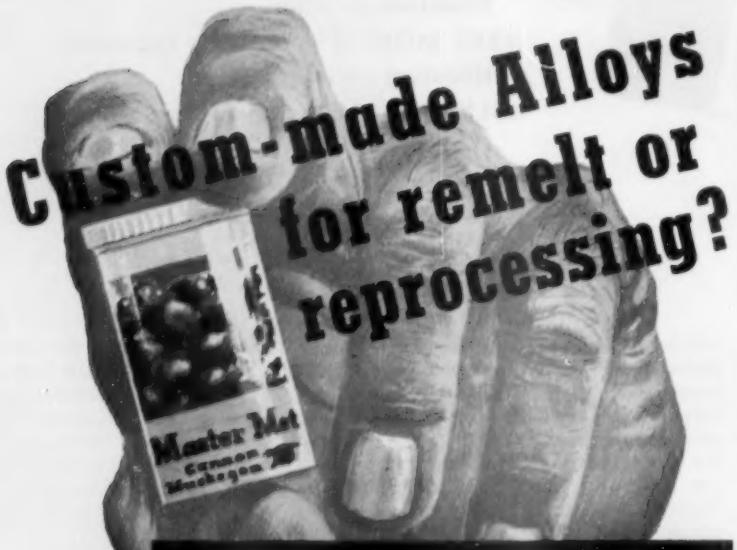
MST 3 Al-5Cr	— 3 aluminum, 5 chromium
RC C-110M	— 8 manganese
RC C-130 AM	— 4 manganese, 4 aluminum
Ti-6A1-4V	— 6 aluminum, 4 vanadium
RS-140X	— 5 aluminum, 1.4 chromium, 1.3 iron, 1.4 molybdenum
Ti-140A	— 2 chromium, 2 iron, 2 manganese
Ti-155 AX	— 5 aluminum, 2.7 chromium, 1.3 iron.

TABLE 2: Effect of interstitial content on mechanical properties*

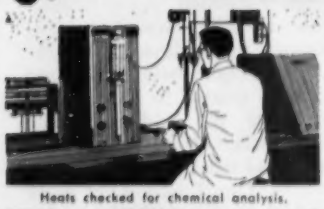
% Alloying Addition	NITROGEN			OXYGEN			CARBON		
	VHN	T.S.	% R.A.	VHN	T.S.	% R.A.	VHN	T.S.	% R.A.
Iodide Titanium	105	43,000	61						
0.1	190	83,000	46	160	63,000	49	137	55,000	49
0.2	260	102,000	35	200	80,000	41	162	66,000	47
0.5	360	98,000	0	280	117,000	30	190	76,000	43
0.7	430	50,000	0	325	138,000	16	190	78,000	30

* From work by Jaffee, Ogden and Maykuth.

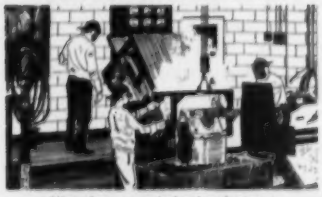
Need pounds or tons of



Call on Cannon-Muskegon



Heats checked for chemical analysis.



High frequency induction furnaces.

Carried in stock are supplies of the 300 and 400 stainless steels as well as carbon alloys. "Specials" including electronic and aeronautical type alloys, tool steels, ferritic, austenitic and super stainless alloys of nickel- and cobalt-base. Available in shot, ingot, billet or cast bars.

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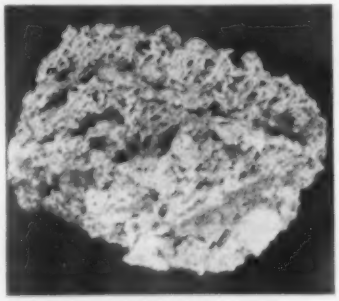
of this heat treatability. The fact that the beta phase can be hardened indicates that it is unstable. The thermal stability is a matter of considerable interest to engineers concerned with using titanium at elevated temperatures. The Ti-6Al-4V alloy is an example of an alpha-beta alloy which has elevated-temperature stability.

Both all-beta and all-alpha alloys have not come as far in commercial alloy development as have the alpha-beta alloys. Exploratory work is now being carried out on both types of alloys. A commercial all-alpha alloy (now available) is the All0-AT (Ti-5Al-2.5Sn alloy. This alloy has a nominal ultimate strength of 120,000 psi and good elevated-temperature strength.



AVOIDING BRITTLENESS is one of the problems involved in converting this titanium sponge to a workable metal.

Actually, commercially pure titanium is also an alpha alloy containing various amounts of oxygen, nitrogen, and carbon. These alloying elements dissolve in the interstices of the titanium lattice and hence are known as interstitial alloying agents. In general it is desirable to keep the interstitial alloy content low in titanium because it becomes rapidly embrittled with relatively small amounts of interstitials. This is indicated in Table 2.

As the table indicates, nitrogen is the most potent of the three interstitial elements in embrittling titanium. Nitrogen is about twice as effective as oxygen in embrittling titanium and oxygen is roughly 1½ times as effective as carbon.

Hydrogen is also an interstitial alloying element. When present in some alpha-beta alloys in amounts above 125 parts per

Continued on page 67

The need for a method of determining the less well-known elements in complex, high-temperature alloys, has lead to this new technique for . . .

TECHNICAL REPORT

Analysis Of Jet Engine Alloys

IN recent years the development of complex high-temperature alloys for jet engines has revealed a lack of accurate methods for chemical analysis of such materials. To obtain the desired combination of high heat resistance and low thermal expansion, the composition of these alloys must be carefully controlled during manufacture. Rapid spectrographic procedures can supply this control provided materials that have been carefully analyzed by other means are available for comparison. However, the high-temperature alloys contain some of the less well-known elements —molybdenum, titanium, tungsten, and niobium—whose chemical properties make analytical separation difficult. In such mixtures, even the determination of nickel—ordinarily a simple matter—may become involved.

Seeking a new approach to this problem, the National Bureau of Standards has developed an accurate procedure[1] for analyzing cobalt-base jet-engine alloys through use of ion exchange, that is, the differential retention of metal ions on the surfaces of certain resins. The procedure permits the quantitative determination of nickel, manganese, cobalt, and iron in the presence of niobium, molybdenum, tantalum, tungsten, silicon, and copper. Development was carried out by J. L. Hague, E. E. Maczkowske, and H. A. Bright of the Bureau's Analytical Chemistry Section.

The NBS procedure was designed particularly for the analysis of an S-16 type of alloy containing 40 percent of cobalt, 20 percent of nickel, 20 percent of chromium, and 4 percent each of niobium, tungsten, and molybdenum. The remainder of the alloy is largely iron, manganese, carbon, and silicon.

In the analysis the first step is to dissolve the alloy in aqua regia. The niobium, tantalum, tungsten, and silicon are then rendered insoluble by hydrochloric-acid dehydration. The solution is treated with hydrogen sulfide to precipitate molybdenum and copper, and filtered. Repeated evaporation of the filtrate with hydrochloric acid and hydrogen peroxide provides a chloride solution of the elements in the proper valence for the ion-exchange fractionation.

The solution of metal chlorides is transferred to an anion-exchange column; and the nickel and manganese, with chromium and some other elements, are collected in the first fraction by washing with 9 *N* hydrochloric-acid solution. Cobalt is collected in a second fraction by washing with 4 *N* hydrochloric acid, and iron in a third by washing with 1 *N* hydrochloric acid.

The first fraction is divided into two parts, which are used to determine manganese and nickel by the persulfate-arsenite titration and dimethylglyoxime gravimetric methods, respectively. Cobalt is determined in the second fraction by electrolysis from a weakly ammoniacal chloride solution containing hydroxylamine hydrochloride, and iron is determined in the third fraction by reduction with stannous chloride and titration with dichromate.

[1] For further details, see Determination of nickel manganese, cobalt, and iron in high-temperature alloys, using anion-exchange separations, by John L. Hague, Edwin E. Maczkowske, and Harry A. Bright, J. Research, NBS 53, 353 (1954) RP2552.

DETERMINATION OF NICKEL, MANGANESE, COBALT, AND IRON IN HIGH-TEMPERATURE ALLOYS

1-g sample

↓

Decomposed with aqua regia, nitrates removed by evaporation with HCl

↓

Residue treated with HCl, gassed with H_2S, and solution filtered

↓

Filtrate (Ni, Mn, Co, Fe chlorides) transferred to a Dowex-1 anion exchange column and washed successively with about 400 ml of diluted HCl

Residue and precipitate Ti, W, Mo, Nb, Ta, Cu (discarded)

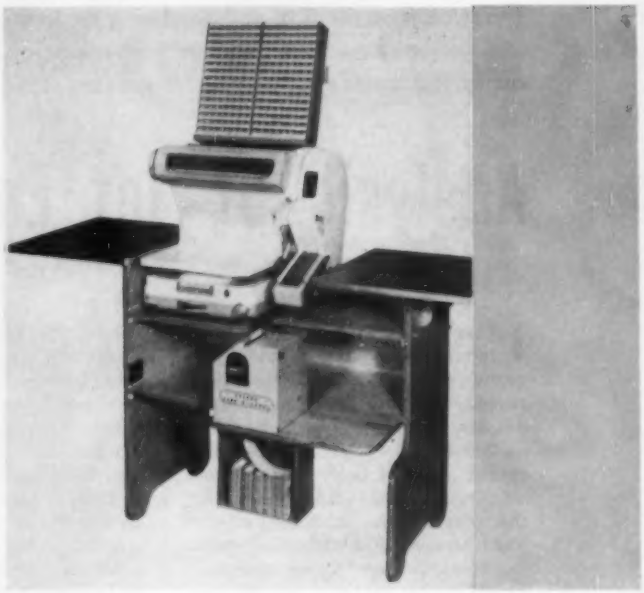
↓

(9*N* wash)
1st fraction (Ni, Mn): Nickel determined as nickel dimethylglioxime; Mn, by persulfate-arsenite method

(4*N* wash)
2nd fraction (Co): Cobalt electrolyzed in ammoniacal chloride solution

(1*N* wash)
3rd fraction (Fe): Iron determined by $SnCl_2$–$K_2Cr_2O_7$ method

INVESTMENT CASTINGS



Accurate relationship of multiple camming surfaces is easier to maintain by specifying investment castings. Toledo Scale finds that . . .

Beryllium Copper Cams Give Good Wear Life

By **G. C. REISER,** Manager, Custom Engineering Dept., Toledo Scale Co.

THE present emphasis on pre-packaging of bulk food-stuffs has caused a marked decrease in the number of computing scales used by retail food merchants. Where a few years ago a large meat market might use upwards of twelve scales, today only one or two are used to weigh an even greater amount of meat. Almost this same ratio holds through the balance of the market.

However, coincident with the change to pre-packaging came the need to mark on each package not only the name of the contents, but also the weight of the package, the price per pound and the price of the package. At first, pre-printed labels were used and the weight and prices filled in by hand.

Now a mechanism is available that takes tickets, blank except for the name of the store, and prints the name of the item being weighed, the weight, the price per pound and the price per package. The operator need only read the price of the piece and press buttons; the scale and the attached printing and computing equipment does the rest so that a finished ticket, printed and cut off the roll is delivered ready for attachment to the food package. Such a computing and printing scale, made by the Toledo Scale Co., is shown above.

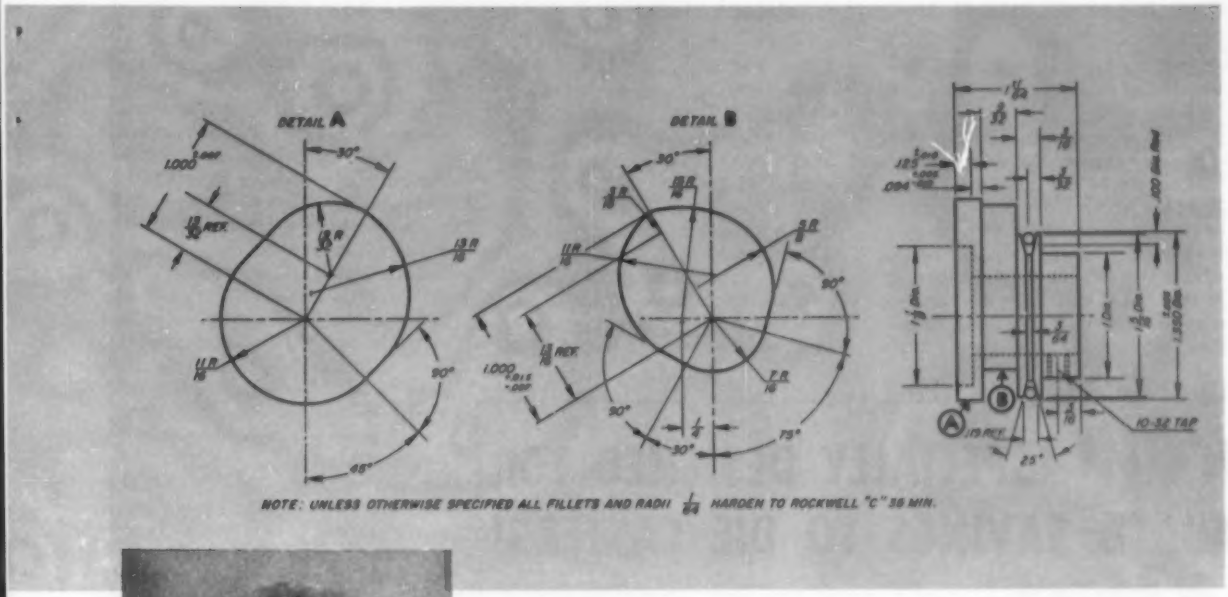
Many of the components used were laboriously machined from wrought steel stock and fastened together by a wide variety of methods including welding, brazing, riveting, staking, bolting, etc.

When the manufacture of these units was undertaken by Toledo Scale, our engineers in analyzing manufacturing methods, recognized at once that a number of the components, particularly some of the complex cams and links could

TABLE 1: Beryllium copper investment castings*

Composition:		
Beryllium	2.00 to 2.25%	
Cobalt	0.35 to 0.65%	
Copper	balance	
Mechanical Properties:		
Tensile Strength as cast	70,000	psi
annealed	55,000	
cast and aged	85,000	
annealed and aged	155,000	
Rockwell Hardness, minimum	60 B	
maximum	39 C	
Yield Strength, minimum	20,000	psi
maximum	115,000	
Elongation in 2 in. minimum	0	
maximum	30%	

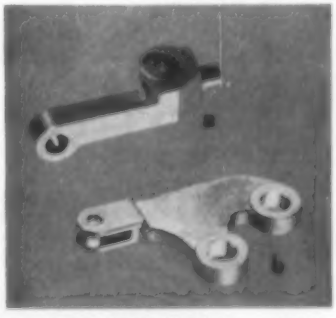
*Berylco 20C



1. **CASTING TOLERANCES** on this complex cam have been worked out by the investment caster and the product designer, as shown on drawing, above.

2. **GOOD SURFACES** are obtained by investment casting this cam, left, that drives the cut-off knife and indexing mechanism.

3. **PAIR OF CAMS** that fit together for multiple actuation are illustrated, above. Tangs of top cam fit into slot in bottom cam to make an accurate, yet simple assembly.



4. **LESS EXPENSIVE** than machining from bar are these two linkages, the knife link (a) and the index link (b).

be more economically and more accurately made by investment casting. This change was, therefore, made at the very onset of in-plant manufacture. Five of these parts are shown and represent a fair cross-section of the type of investment castings that are currently being made for the company by Hitchiner Mfg. Co.

Since both the hardness and wear resistance requirements could be met by an age-hardenable copper base alloy, beryllium copper was selected because of its excellent castability and because it is relatively easy to meet the surface roughness tolerances of 125 micro inches or smoother with this alloy.

As noted, all of the parts are cast in beryllium copper. The excellent fluidity and castability of this alloy, coupled with its ability to be heat treated to a fairly high hardness make it particularly good for investment castings wherever such a copper base alloy can be used. Of the several grades of beryllium copper that are available, Berylco 20C is used for all of these parts. Some of the properties of this alloy are shown in Table 1.

Normal heat treatment is to solution anneal at 1475 to 1500 F for one hour per inch, or fraction of an inch, of thickness and quench directly from the furnace in water. Age at 650 F for three hours and cool to room temperature. Cooling can be by any convenient means. This heat treatment gives the maximum physical properties listed above. Salt baths are not recommended for either the solution anneal or for aging.

The cam shown in Figure 2 drives both the cut-off knife and the indexing mechanism in the ticket feeder (this is the device shown below the scale in Figure 1). A casting drawing of this cam is shown in Figure 1, which repre-

Continued next page

sents the best compromise between the desires of the designer and the ability of the vendor to produce a part that does not require subsequent machining.

Both camming faces operate linkages which must move precise amounts in carefully timed sequence so that the angular relation between the two cams is highly important as is the accuracy of throw. For example, on cam surface A, the maximum throw was originally designed as 1.000 ± .002. To secure this close a tolerance would, of course, require machining after casting. This tolerance was, therefore, opened to 1.000 ± .005. Production under these tolerances was tried for about a year and then the tolerances further opened to the present ± 0.007 to make casting to final shape more practical.

In the same manner, the tolerance on the maximum throw of cam surface B has been progressively changed from the original ± 0.002 to the present + 0.015 - 0.007. In connection with cam B, it is of interest to note that a redesign of this part will not permit such open tolerances and, while the cam will still be investment cast, this face will have to be machined to bring it within operating requirements.

Both cam surfaces run against drill rod followers but the load between the two mating surfaces is quite light. For this service, then, it is adequate to harden the part to 35 Rockwell "C". Speed is also low, at the rate of 55 rpm, with a probably maximum speed (which depends on the speed of the person doing the weighing) of 20 to 25 complete cycles per minute. Because of the light operating loads and the low speed, there has been no need for providing lubrication on the wearing surfaces; after about 1½ years in the field, there is no evidence of intolerable wear, no actual life tests are yet available.

Methods Compared

The simplicity of using a single complex casting as against the older method of fabricating is brought out by considering the original method of manufacture. The two cams, A and B, were separately machined from steel stock and then fastened together with flat head machine screws. The hub section carrying the "V" groove pulley was a third major component which had to be fastened to the cam assembly as a second sub-assembling operation. Even considering the use of automatic equipment for generating the cams, the chances of error in assembly were great and the exactitude of reproduction from piece to piece is not nearly as great as is common in investment casting.

The two cams shown in Figure 3 are co-operating members in that the tang on the one part must fit the slot on the other and the common bore must line up exactly. Further, angular relationship between the five different cams becomes increasingly difficult to maintain.

Both of these parts are used on the imprinter which prints the weight and total price on the label. These parts operate at the same frequency as those described above and, while substantially

Continued on page 68

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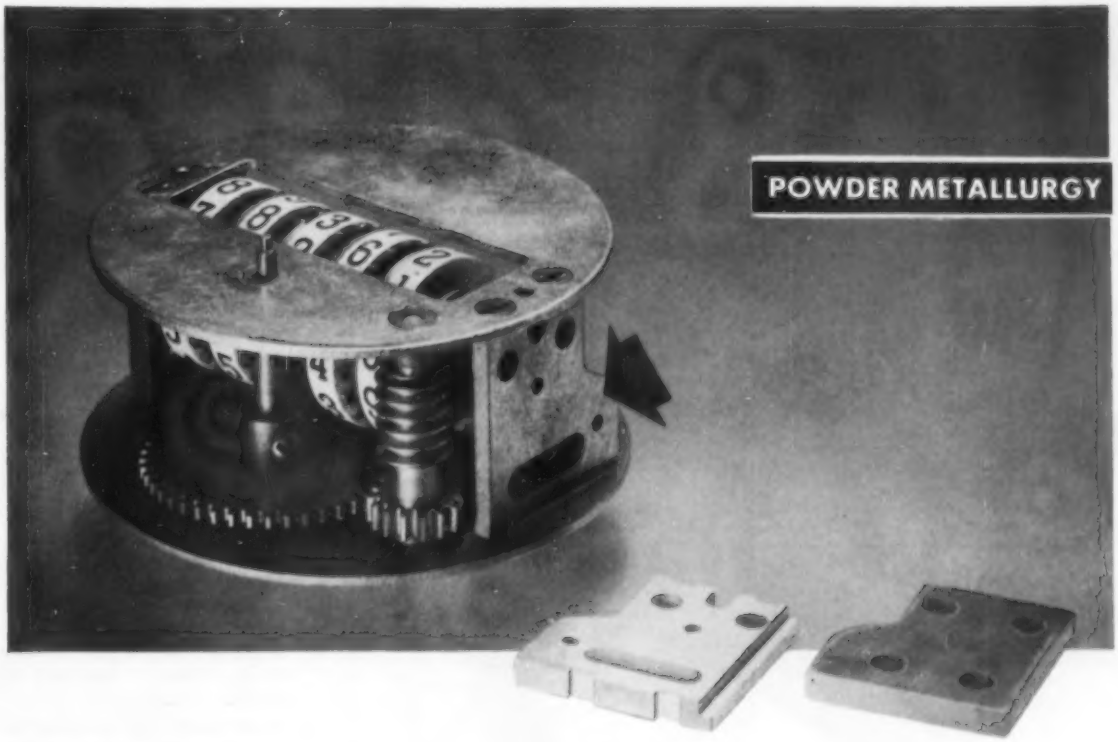


Besides reducing direct manufacturing costs, you can . . .

Take Advantage Of Indirect Savings Too

POWDERED BRASS

1. Press and sinter
2. Drill & tap four holes
3. Counterbore two shaft holes
4. Nickel plate

WROUGHT BRASS

1. Blank & pierce four clearance holes
2. Shave
3. Mill slot
4. Drill two shaft holes & four holes for tapping
5. Counterbore for two shaft holes
6. Tap four holes
7. Countersink four tapped holes
8. Chamfer the edge
9. Nickel plate

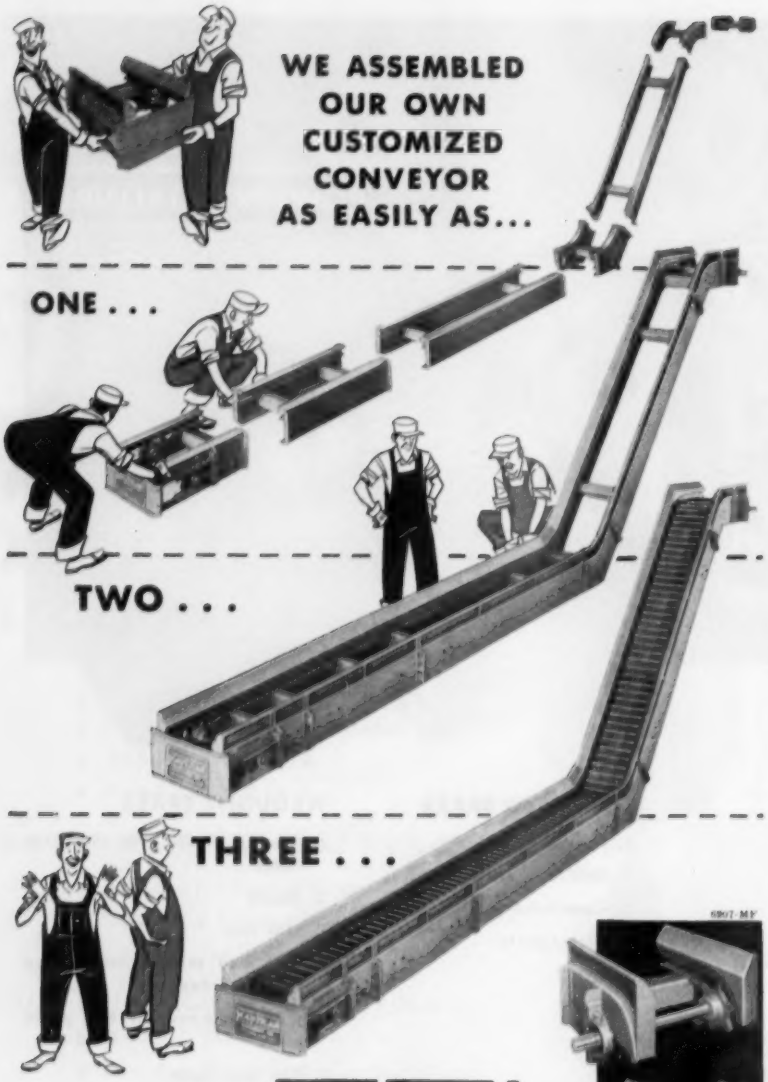
IN the pillar blocks used for mounting the components of a water meter register, the D. S. Plumb Co., Inc. has found that parts made from powdered brass show an overall manufacturing saving of at least 45 percent in direct costs and a high, though intangible, saving in indirect costs.

The register assembly and two styles of pillar blocks are shown in Figure 1. The block made from powdered brass is shown on the left and the older style block made from plate stock on the right. This latter block is shown in only the semi-finished condition. A comparison of the amount of machine work needed to ready both pillar blocks for assembly shows clearly why powder metallurgy shows the impressive savings that have been found. These operations are tabulated below the photograph.

From this tabulation, the great saving in machining operations is at once apparent. A further saving occurs in tooling. The cost of tooling for powder metallurgy is about equal to that for blanking. It follows then that the cost of shaving dies is saved as is the cost of one drilling and at least one and possibly two milling fixtures. Further, the tool maintenance costs are drastically reduced since one set of tools for powder work will, with proper care, produce several years supply of blocks. With the older method of manufacture, both the blanking and shaving dies had to be resharpened fairly often and there is a constant consumption of both drills and milling cutters.

Nickel plating of the powdered brass part is as simple as for the

Continued next page



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Pre-fabricated sections are available rapidly and inexpensively. Straight sections . . . concave or convex sections . . . take-up charge and discharge-end sections can be furnished to meet specific requirements of belt width as well as load bearing and volume capacities.

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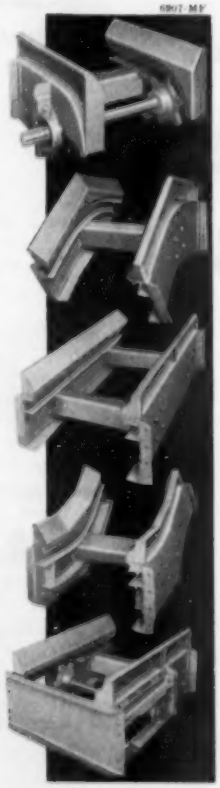

MAY-FRAN

ENGINEERING, INC.

1686 Clarkstone Road • Cleveland 12, Ohio

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part made from wrought brass. Barrel plating is used and there has never been any problem of bleeding due to porosity of the brass compact.

These powdered metal parts are produced for Plumb by Ferro Powdered Metals.

The advantages of using a powdered metal part that are detailed above are all translatable into direct costs. There are other real savings although they appear only as general overhead.

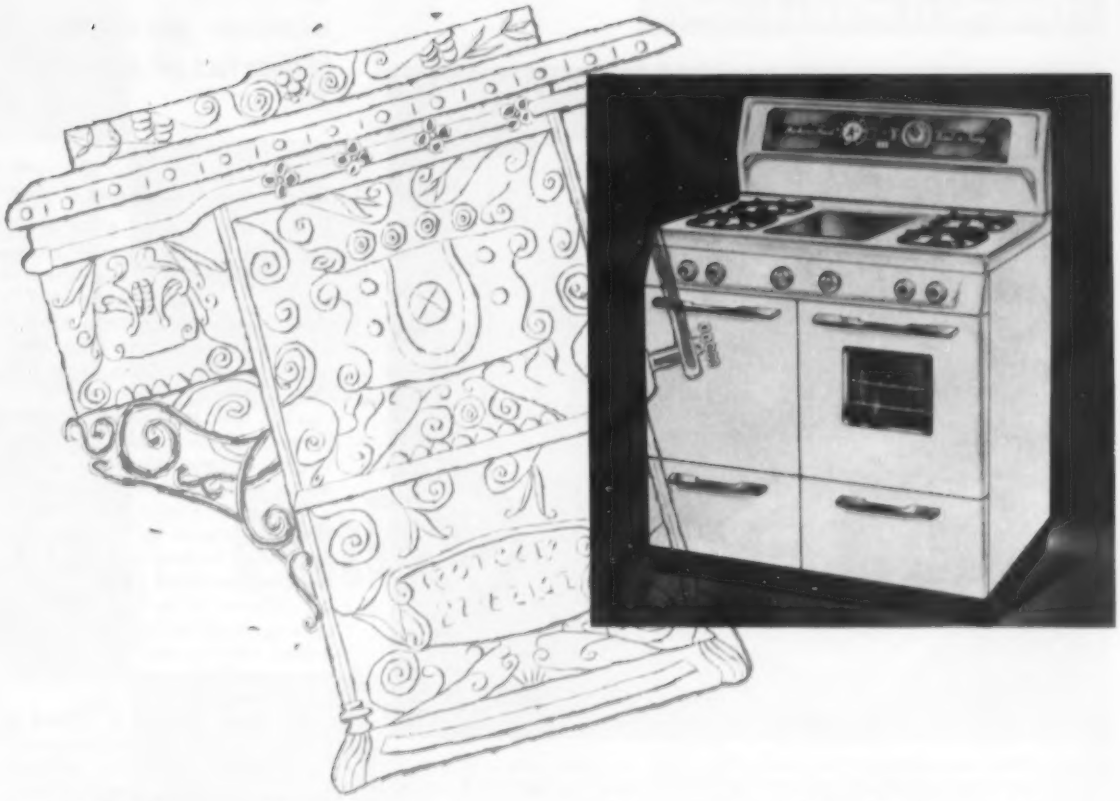
- *Reduction of inventories.* Only the finished pillar blocks need to be carried in stock. There is no inventory of raw material or of semi-finished parts.
- *Reduction of inspections.* Only one inspection, at the time the parts are received, is necessary and this is reduced to the statistical minimum of about 2 percent due to the inherent accuracy of powder metallurgy.
- *Faster assembly.* Because the powder parts are more uniform, assembly is faster. Alignment of the two shafts is automatically assured since the bearing holes are always in exactly the same relative position to each other and to the base of the block. Variations, even within drawing tolerances, of hole alignment can slow down assembly due to the necessity of matching end blocks to maintain shaft alignment.

Due to the natural bearing quality of the brass used to make these pillar blocks, the steel shafts can run in cored holes. However, where the drive and counter shafts pass through the two steel plates additional bushings are needed. For this service, four standard self-lubricating bushings, another powder metallurgy product, are used.

J. R. TOWNSEND TO STUDY NICKEL SUPPLY

John R. Townsend, director of materials and standards engineering for the Sandia Corp. has undertaken to study the current and prospective nickel situation at the request of Defense Mobilization Director Arthur S. Flemming.

Mr. Townsend will analyze government activities relating to nickel, including stockpiling, expansion programs, and military and atomic energy needs.



A Modern Range versus Grandma's Stove?

Aluminum Castings Are One Big Difference

MODERN kitchen ranges are a far cry from the cast iron giants that dominated household culinary arts in grandmother's day—and cast aluminum parts are among the major factors that have made possible this welcome transition.

The deluxe line of ranges manufactured by Tennessee Stove Works, Inc., Chattanooga, Tenn., illustrates typical advantages of precision cast aluminum products in the evolution of household cooking units.

Time was when cast iron burners, usually star-shaped, were the standard in gas-burning kitchen stoves. The burners had rows of gas-holes along their tops to send the flame directly upward.

More often than not, some of the holes were gummed-up with substances spilled in cooking. Also, the burners became rusty and greasy — and were difficult to clean. Finally, when stoves were equipped with automatic lighters, it was perceived that the vertical gas flow was not reliably ignited.

Thus, both from the standpoint of performance and appearance, the old sand-cast iron burners left much to be desired.

In modern contrast are the die cast aluminum burners that this typical stove-maker obtains from W. S. Schoenberger Co., Cleveland, Ohio. Instead of being star-shaped, these burners are round. Instead of having gas apertures on top, they have slots — formed by the casting process — on the under side. When the burner is fastened to the head of a gas venturi tube, the slots cause the gas to shoot out horizontally. This makes them far more responsive to automatic lighters and also provides a broader heating area.

Yet, from the standpoint of consumer appeal, the improved appearance of the burners is at least equally important. In aluminum, the burners present a permanently gleaming appearance, with a surface that is free from rust and roughness, and that is easily wiped clean.

Still more eye-catching in another line of the same company's stoves are the aluminum alloy griddles, formed by permanent mold castings, and obtained from Exalco Mfg. Co.

In operation, the griddle is positioned in the center of the stove, above a fifth gas burner. As the

Continued next page

PERMANENT MOLD CASTINGS

RADIAL RIBS help distribute heat uniformly across the entire area of this permanent mold cast griddle. Aluminum's good heat transfer properties favor its use here.

DIE CASTINGS

BURNERS HAVE SLOTS die cast accurately, saving radial drilling. Smooth top surface is easy to polish to an attractive lustre. Die cast name plate is chromium plated zinc.

HEAT CONDUCTING AND LIGHTNESS ARE USEFUL PROPERTIES OF ALUMINUM

Modern Range—Continued

burner is only about 5" in diameter and is beneath the center of the griddle, it was desired to make the cooking surface of a metal having a superior quality of heat conductivity. An alloy having an aluminum base, as chosen, fitted this requirement perfectly, and the heat spreads easily to the far ends of the griddle despite its length of approximately 16¾"; width is 11", thickness 3/16".

To assist in heat conductance, ribs are formed by the mold on the under surface of the griddle, radiating outward from the center. These also increase the strength of the product. Four bosses, cast on the under side of the rim, hold the griddle in proper position on the stove top.

The upper surface is ground to a satin finish in the cooking area, on the theory that this tends to prevent food from adhering to it. The outer rim, however, is highly polished for appearance.

Around three sides of the upper surface, a groove is formed by the molding to serve as a runway for grease. At the rear, a deeper depression is a grease collector.

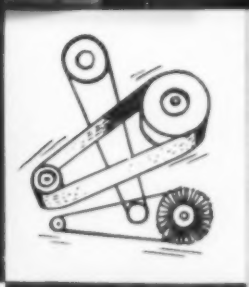
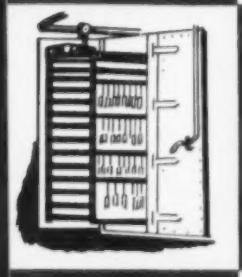
As with the burners, aluminum molding to serve as a runaway for the sake of better appearance also, as compared to the alternative possibility of cast iron. Moreover, the appearance of iron could not be permanently altered by plating, for plating would not be durable when subjected to high temperatures and scouring.

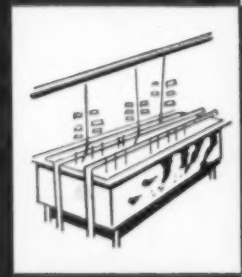
Other factors favoring cast aluminum for the griddle are its lighter weight, and the fact that the final product has proved less expensive than it would have been if made of cast iron.

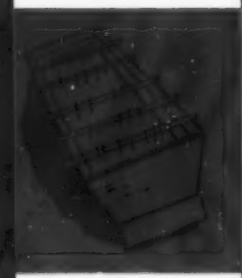
Stainless steel was also considered for the griddles. It was rejected because it would be subject to warping, and considerably higher in cost.

The third major item in these stoves is the die cast nameplate. Until recently, the nameplate was a stamping.

Continued on page 69





PMM

Finishing Section

Finishing includes all secondary operations performed on precision metal molded parts — up to and including final surface treatment. This section presents new information about the specialized methods, equipment and materials needed for finish-machining, assembly, surface preparation and final finishing of all precision metal molded parts.

devoted to the specialized problems of finishing . . .

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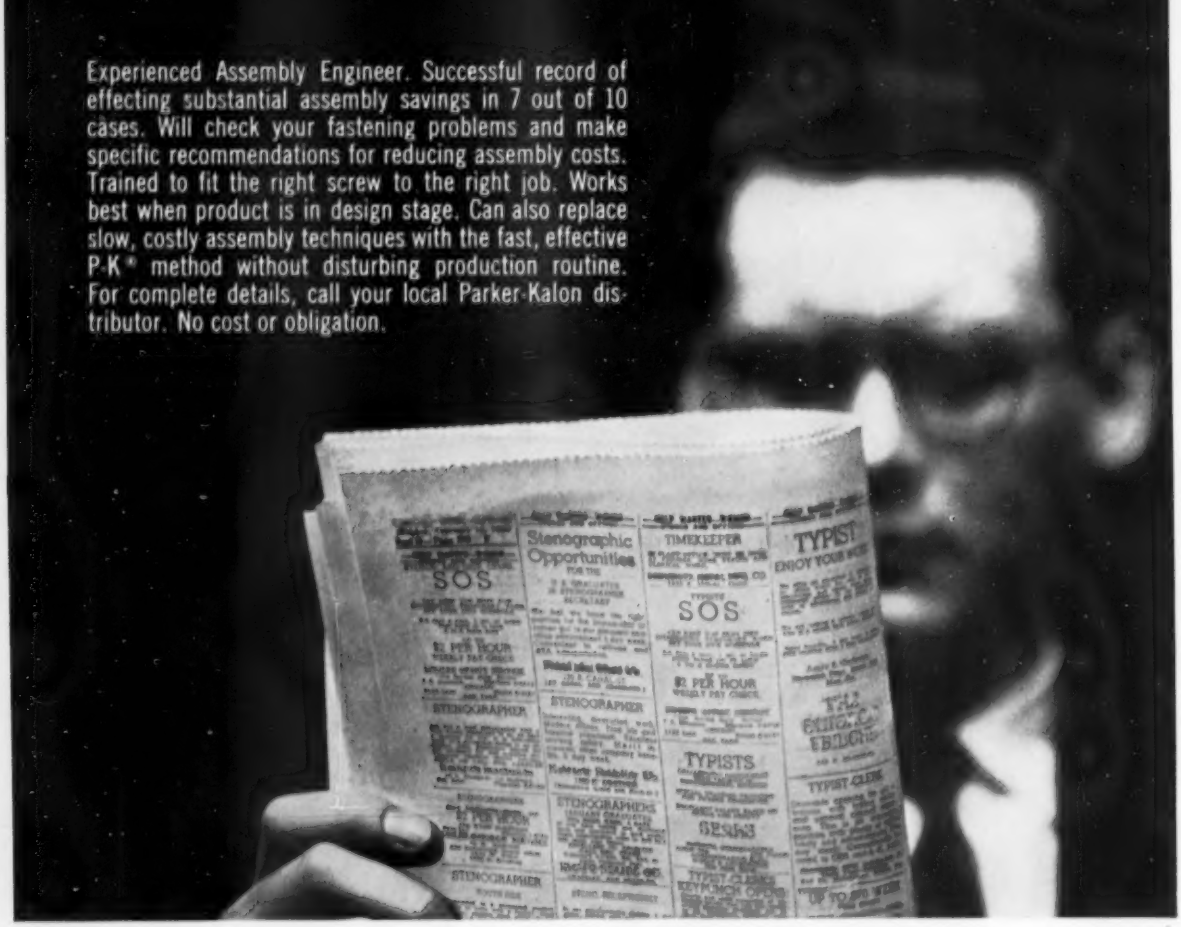
Experienced Assembly Engineer. Successful record of effecting substantial assembly savings in 7 out of 10 cases. Will check your fastening problems and make specific recommendations for reducing assembly costs. Trained to fit the right screw to the right job. Works best when product is in design stage. Can also replace slow, costly assembly techniques with the fast, effective P-K® method without disturbing production routine. For complete details, call your local Parker-Kalon distributor. No cost or obligation.



this specialist wants to work for you!

Call in a P-K Assembly Engineer and find out how you can profit through reduced assembly costs the P-K way. Take advantage of this unique Parker-Kalon service—another of the many reasons why users say—"if it's P-K . . . it's O. K."

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PARKER-KALON® *fasteners*

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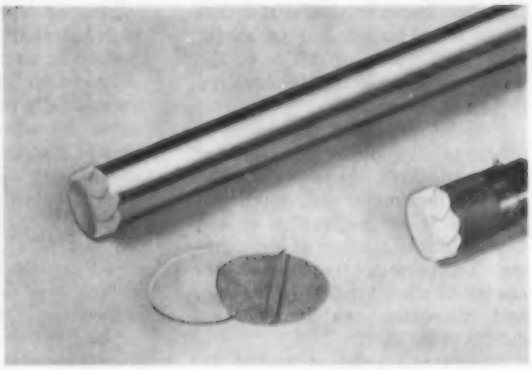
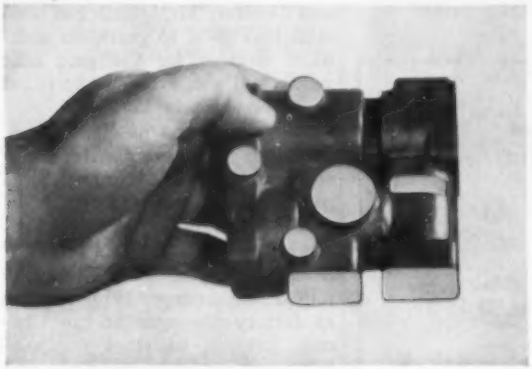
PAINT SPRAY MASKING is one of the most common applications of pre-cut self-sticking tape. Here, the tape is left in place during shipping for protection of the nameplate.



FINE FINISHES, such as this gun barrel, need positive protection from factory to user. Self-sticking tapes are used increasingly for protecting this investment in finishing.



TEMPORARY SEAL to keep out dust, dirt and moisture during handling and shipping is an application for this type of tape. This protection saves inspection or cleaning before installation.

SMALL-AREA PROTECTION, such as the edge of this cutting tool, can be accomplished readily with tapes that are applied with simple finger-pressure. Delicate detail can be protected this way.

Pre-Cut, Self-Sticking Tape Has Many Uses

PRE-CUT, self-sticking industrial tapes are finding increased usage in the metal-working field today, especially where products require paint masking, protection during shipping, identification or selective surface treatment.

This is due to the tremendous variety of types available; one manufacturer, for example, the W. H. Brady Company of Milwaukee, makes pre-cut masking shapes of vinyl plastic, paper, fiber, cloth, foil or other materials, with different combinations of adhesives and backing materials, all available in many shapes, weights and sizes.

Tapes are available for masking during painting, flow-coating, dipping, brushing and sanding, as well as storage and shipping. Some resist temperatures and chemicals while others are intended to resist moisture, abrasion or other service conditions.

Four of the main applications for this type of self-sticking tape are illustrated above, but of these, probably the most important and commonest usage is for selective painting. Because these tapes conform to irregular surfaces, whether flat, curved, depressed, tapered or threaded, they have have been used during the spray painting of die castings, most of which are characterized by complex contours.

The advantages of pre-cut tape over hand cutting for paint masking have been listed by one user as: (1) saving in time and material, (2) improved quality of

Continued next page

paint job because hand-cut masks often were pulled out of shape, (3) one person can often do the work of two, and (4) lowered finishing costs.

Pre-cut masking produces a sharp, precise line when used for paint masking because it has positive perimeter adhesion, yet the tape leave no residue of adhesive on the surface of the casting. Temperature resisting tapes are often used for paint masking, and therefore can be left on during baking.

Where many tapes are to be applied to a single casting or area, these can usually be combined on a single dispenser card, so that the operator cannot make the mistake of forgetting to mask off one area.

Size of tapes that are pre-cut to fit individual requirements vary widely in size and complexity.

Large or small areas can be successfully masked by tapes, and most manufacturers have catalogs of standard styles and shapes of pre-cut tapes, such as those used to cover tapped holes during spraying.

For special applications, where tapes are die-cut to order, an accurate cost estimate can be obtained from the manufacturer of tapes by submitting the following information:

1. A cut-out, sketch, blueprint or dimensions of the mask or masks required. If surface to be masked is irregular, it is advisable to send a sample of the part itself.
2. Details of application. What will be masked, type of surface, type of paint, solvent, detergent, maximum heat, etc.
3. Quantity needed.
4. Wording if printing is involved, and whether you will furnish the printing plates for this.

H-VW-M PROMOTES DIGGIN

Hanson-Van Winkle-Munning Co., Matawan, N.J., has announced the appointment of Myron B. Diggin as vice president and director. Mr. Diggin has been with H-VW-M 25 years, its technical director for the past nine years, and was made an assistant vice president in 1954.

The retirement of Nicholas A. Munning, vice president of Hanson-Van Winkle-Munning Company, was also announced.

Mr. Munning served in numerous capacities during his 38 years' association with H-VW-M. He joined the firm in 1918, serving as factory manager at the Chicago branch, assistant purchasing agent, assistant treasurer and credit manager. He was elected a director of the company in 1940, served as secretary for six years and became a vice president in 1952.

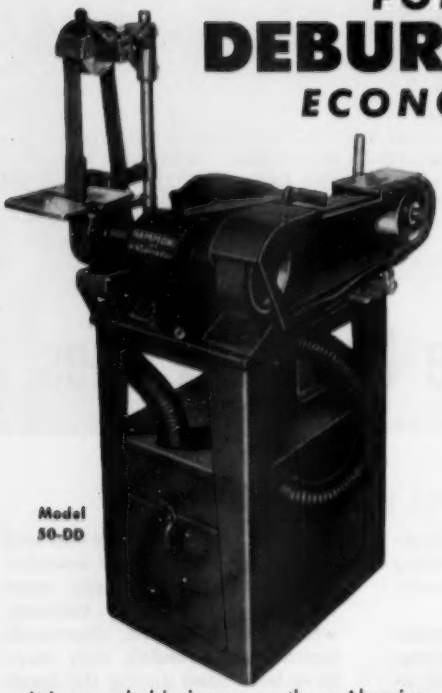
Mr. Diggin joined H-VW-M as a chemist, and was appointed chief chemist in 1933. His work has resulted in a number of developments and patents, particularly in the depositing of cadmium, zinc and lead; in rack coatings, anode diaphragms, and regenerative plating systems. During the past year he has worked on the specific development and use of H-VW-M electro-chemical processes.

EXPAND CANADIAN OPERATIONS

Metal & Thermit Corporation, New York, and United Chromium of Canada, Limited, Toronto, will combine Canadian activities under the name of Metal & Thermit —United Chromium of Canada, Limited, H. E. Martin, president of Metal & Thermit has announced. He also disclosed plans to construct new office, warehouse and plant facilities in Toronto to house the joint operation.

Hammond of KALAMAZOO

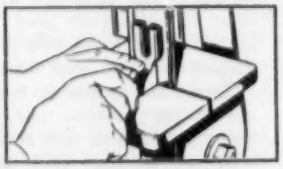
FOR DEBURRING ECONOMY



Model 50-DD

CONTACT WHEEL

IRREGULAR SHAPES



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11 combinations available with or without Duskolector.

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Hammond Machinery Builders

1642 DOUGLAS AVENUE KALAMAZOO, MICHIGAN

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RELEASE NEW MOVIE ON ELECTROPLATING

Bart-Messing Corporation of Belleville, N.J., announces the completion of an educational motion picture with sound, dealing primarily with the electroplating facet of metal products finishing.

Entitled "A Brighter Tomorrow" this 16 mm technicolor film which runs approximately 30 minutes, visits the various plants of the Bart-Messing Corporation where a number of interesting metals finishing processes and applications are observed and described. It gives a panoramic view of electroplating, from the anti-corrosive electro-deposits of nickel on airplane propellers, steel sheets and pipes and fittings, to the functional or decorative electroplating of gold, rhodium and silver on electrical or electronic components, jewelry and various household articles.

A print of "A Brighter Tomorrow" is available free of charge to qualified organizations for showing at sales meetings, conventions, educational seminars.

REPRESENTS ROTO-FINISH

Instituto Electroquimico, S. A. of Barcelona has been appointed Spanish representative of The Roto-Finish Co. of Kalamazoo, Mich., to handle its Roto-Finish machines and equipment.

DATA IN ADS
continued from page 18

30. ENGINEERING DATA, technical information and recommended uses are included in a new booklet on zinc base alloys for die casting prepared by Henning Bros. & Smith Inc.

47. INTRICATELY DETAILED castings, smoothly finished to accurate tolerances are described in a brochure that has been issued by Ohio Precision Castings, Inc.

74. AUTOMATIC TAPPING for long production runs with repetitive thread accuracy, fewer broken taps and other advantages is the subject of a new brochure from Procunier Safety Chuck Co.

76. REDUCE DIE MAKING COSTS with a highly accurate cross-slide rotary table. Set-up time is said to be reduced by as much as 90 percent according to specifications and literature from Morrison Engineering Co.

Send for this new booklet of facts and figures on TAP-LOK® INSERTS

Here is a new guide to strong, wear-resistant tapped threads in non-ferrous metals, plastics and other structural materials . . . through the use of TAP-LOK INSERTS.

You'll find detailed information . . . illustrations, typical applications, specifications . . . on these internally and externally threaded bushings of steel or brass which increase shear area in one self-tapping operation.

Write for your free copy today.

Also manufacturers of Groov-Pins for positive locking press fit.

GROOV-PIN CORPORATION

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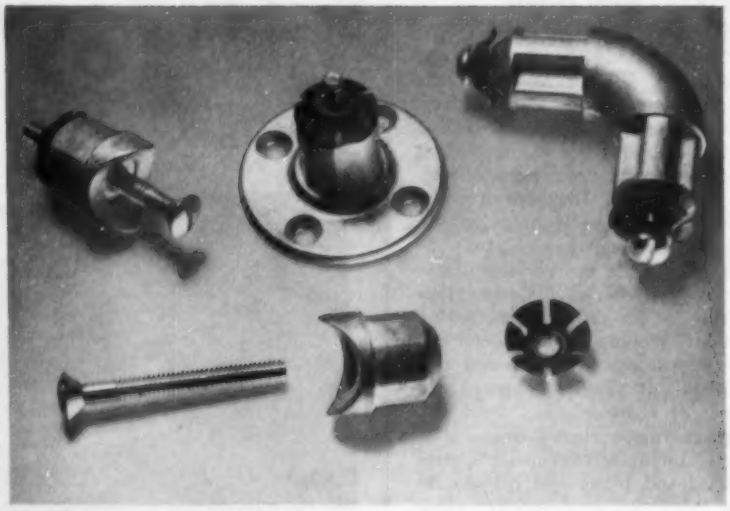
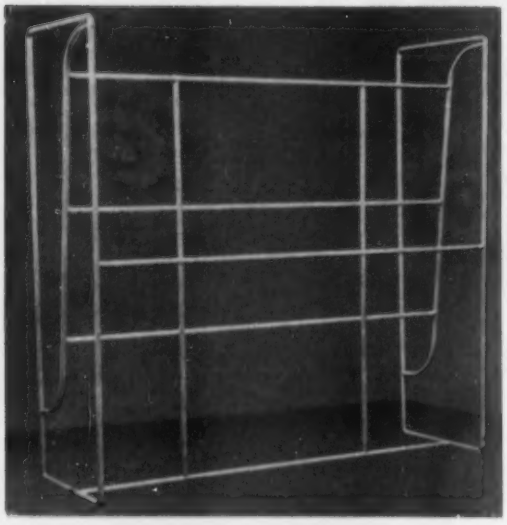
DIE CASTINGS



DIE CAST FITTINGS for assembling stands, racks and other structures from aluminum tubing were designed for the Do-It-Yourself clan, but have found important industrial usage, too. Low cost-high production requirements dictate the use of die castings with efficient secondary operations.



Machining die cast aluminum fittings has been simplified by this company which uses air control for . . .

Drilling And Tapping 1000

MANUFACTURED originally as items for the "do-it-yourself" trade, three die cast aluminum fittings designed and made by Cleveland Hardware & Forging Co. are finding increasing usage in the industrial field.

The basic idea of the castings was for assembly of the fully annealed tubing into stands, racks, railings, etc. by the home craftsman who lacked either the skill or facilities for bending, joining or otherwise working the aluminum tubing.

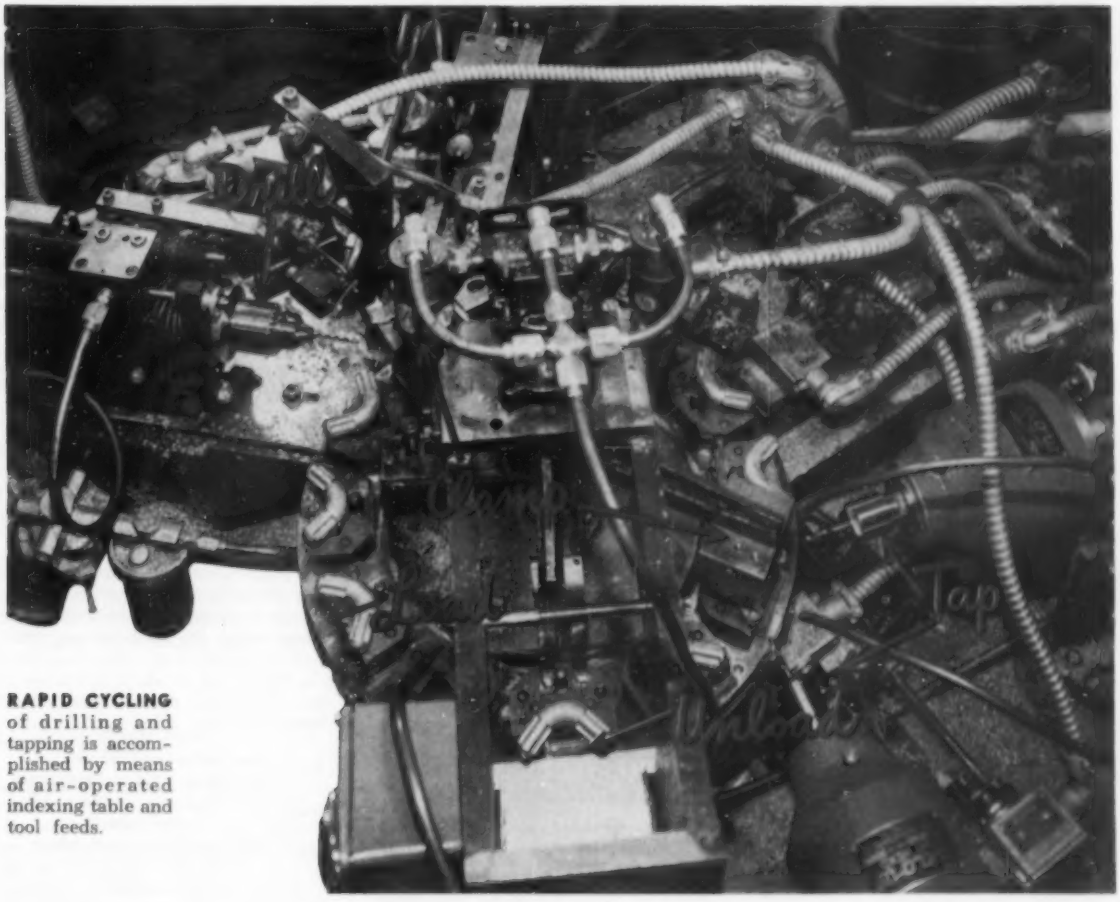
Now, however, industry has taken up the cast fittings since they allow rapid assembly and disassembly, reduce the time required to build up permanent fixtures such as racks and railings and where portability is a factor such as in display units and scaffolding allow the use of all aluminum to lower the weight that must be transported.

As can be seen, the castings are quite simple. The tubing is slipped over the shouldered segment and by tightening the machine screw, a specially designed spring steel fastener bites into the tubing to hold it firmly in place.

Tightening is done with a screwdriver for both the flange and the butt connectors, but the elbow must first have the fastener spread just enough to fit the ID of the tubing snugly when it is pressed on. Then the tube is turned and this further tightens the machine screw and hence the fastener is flared slightly more giving it a firmer purchase. A display rack capable of holding several hundred pounds made up from these die cast fittings and aluminum tubing is shown.

Naturally, both fully annealed and cold drawn aluminum tubing can be used for making assemblies with these fittings. The cold drawn tubing has the advantage of greater rigidity and strength, but the possible disadvantage of slightly more difficult working, particularly if bends either greater or less than 90° are desired.

For those cases where a permanent installation is desired, the fittings have been designed for



RAPID CYCLING of drilling and tapping is accomplished by means of air-operated indexing table and tool feeds.

Pieces Per Hour

use with a reactor type adhesive. The use of an adhensive is one of the reasons for the plug portion of the fitting being formed as an octagon rather than a cylinder. Four of the faces are arcs of circles, either ¾, 1 or 1¼ inches in diameter, while the other four faces are chords. This gives some room for excess adhensive to squeeze out.

The plug portions of these fittings have, of course, a slight taper required by the die casting process. However, at the root of the plug, just adjacent to the shoulder, a somewhat greater flare is incorporated into the plug so that as the steel fastener pulls the tubing down onto the fitting the end is slightly flared to give a tighter fit.

ECONOMICAL manufacture of these die cast fittings entails the elimination of as many secondary operations as possible . . . two of them have holes cored to proper size and need no further machining; but, where machining is needed, as in the die cast elbow, the most efficient method possible has been required.

To drill and tap two holes at right angles to each other, Cleveland Hardware has built a special, air-operated rig with which one operator, whose only job is to load workpieces into the fixture, can finish 1,000 elbows per hour.

The indexing table has positioning pins which automatically align the elbows for drilling. The table then indexes to the drilling station where an air operated clamp, actuated with an air cylinder using full line pressure of 80 psi clamps the elbow to the table while the drills are advanced, again with air cylinders.

When drilling is completed, the table is indexed to the tapping head. After tapping, the head is retracted and the table indexes to the discharge position where two fingers lift the casting and push it into a chute that discharges into tote pans or other containers.

On this machine, all of the air operated devices, air filters, etc., including the drill heads and indexing table, are standard units made by the Bellows Co. The tappers are standard Snow tapping heads. Under present operating conditions and utilizing Rex top cutting oil as a coolant about 3000 elbows are drilled and tapped between tool sharpenings.

Except for the clamps which, as noted, use full line pressure, all air operated devices operate on only 30 psi air pressure. The coolant is filtered and recirculated constantly by a Grey-Mills filter.

ALLEN NORTON RETIRES; WITH ALCOA 42 YEARS

Allen B. Norton, general manager of Aluminum Company of America's castings division and an inventor and developer of many of the light metals casting techniques in use today, has retired after more than 42 years of service with Alcoa.

Harold C. Erskine, assistant general manager of the castings division since mid-1954, has been named to succeed Mr. Norton.

Born in Morrison, Pa., Mr. Norton joined Alcoa as a chemist at Detroit, following his graduation from Cornell University with the degree of bachelor of chemistry in 1913.

In January, 1917, he was named assistant general superintendent of Alcoa's castings operations with headquarters at Cleveland. He was moved to the managership of Alcoa's castings division in 1928. In 1943 Mr. Norton was transferred to Pittsburgh to continue this managerial responsibility in an area marked by continual growth.

Fixed Spindle Multiple Heads
Flex-Shaft Spindle Adjustable Multiple Heads
Geared Spindle Adjustable Multiple Heads

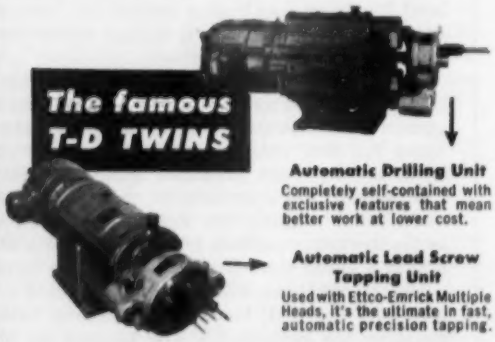
Unit engineered for greater small hole drilling and tapping production!

ETTCO-EMRICK MULTIPLE HEADS

BOTH the head and workholder are designed as a *unit* to your requirements to give you a *complete* high production system capable of maintaining highest production rates on your drill press. Thus, you are not only assured of drilling and tapping the maximum number of holes at each stroke but — what is just as important — the fastest handling of the parts.

SEE FOR YOURSELF. Send samples or drawings of your parts with basic production data. We'll give you recommendations and prices.

For details, ask for our Multiple Head Bulletins.



The famous T-D TWINS

Automatic Drilling Unit
Completely self-contained with exclusive features that mean better work at lower cost.

Automatic Lead Screw Tapping Unit
Used with Ettco-Emrick Multiple Heads, it's the ultimate in fast, automatic precision tapping.

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ETTCO TOOL CO., INC.
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Ettco-Emrick
the right equipment for every small hole drilling and tapping need.

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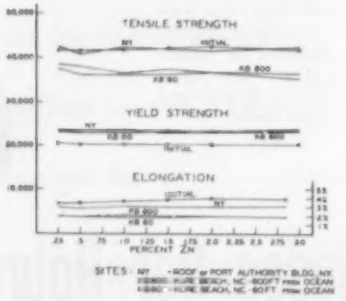
CORRECTION

Attention is called to errors which appeared in the presentation of Part 2 of Donald L. Colwell's article, "Zinc and Aluminum Die Casting Alloys," in the March 1956 issue of Precision Metal Molding. The editors regret these unfortunate omissions.

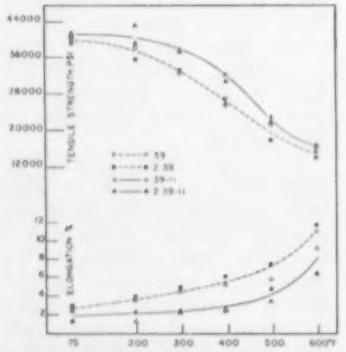
On page 41, Figure 13 concerning outdoor aging and corrosion of alloy SG100A, the tensile strength for commercial purity alloy exposed for two years at Sandy Hook should have been 41,000 psi.

Due to a typographical error, a key line was dropped from the copy on page 42, which should have said, concerning alloy Z39-11, "It is an excellent alternate for S12A in its castability."

Furthermore, two extra charts are presented here, with appropriate captions for identification. They were Figures 18 and 19.



18. UP TO ALMOST 3 PERCENT, zinc does not impair the corrosion resistance of Z-39 alloy, as shown in this report of test results.



19. COMPARISON of alloys having 9 percent and 11 percent silicon at elevated temperatures is presented here.

CASTING ABOUT

continued from page 8

A CAREER IN THE TOOL & DIE industry? A monograph intended for those considering entering the tool and die industry has been published by Bellman Publishing Co., Cambridge, Mass., for $1. It covers: history of the industry, qualifications for employment, training required, methods of entry, opportunities for advancement, earnings, general trends, and sources of further information.

NEARLY 10 BILLION for research will have been poured out of corporate treasuries by the end of 1956, according to Dr. Eugene Wainer, vice president and research director of Horizons, Inc. Most important of this industrial research will be in the field of transition metals including uranium, thorium, titanium, niobium, tantalum, zirconium, hafnium and the rare earths. Three other fields to get major attention, according to Dr. Wainer, are graphic arts, powder metallurgy and foundry practices.

LARGEST CAST rolling mill housings ever produced in this country are believed to be a pair recently completed by United Engineering & Foundry Co. Each of the housings will have a finished weight of 400,000 lbs., and required 600,000 lbs. of molten metal in pouring. The molds were set in a pit measuring 86 x 32 x 18 feet deep divided into two sections. Five open hearth furnaces were tapped into five ladles which were poured simultaneously.

DOW ANNOUNCES MAGNESIUM PRICE RISE

A price increase of 1¼ cents a pound for primary magnesium and increases for other magnesium products were announced recently by Dow Chemical Co.

The increases, which became effective April 16 bring the price of primary pig to 33¾ cents a pound and primary ingot to 34½ cents a pound, both f.o.b. Velasco, Texas.

The practice of allowing a 2 cents a pound discount on primary when the buyer certifies a magnesium end use will be discontinued.

The price of AZ91B die casting alloy will be advanced 4 cents a pound and most other alloys 3¼ cents a pound. Anodes will be boosted 3½ cents a pound.

Magnesium mill products, including sheet and extrusions, are increased about 10%. The form factor system of extrusion pricing, common to the light metal industry, is being adopted.

A spokesman for Dow said the increases were necessary for several reasons, including the recent hike in freight rates, higher material costs and increased labor costs resulting from new labor contracts signed last week. He also pointed out that the magnesium industry will soon need expansion of primary production capacity at a much higher investment per ton.

HAROLD COLLINS APPOINTED

The appointment of Harold F. Collins as vice president in charge of sales, has been announced by Metals Disintegrating Company, Inc., Elizabeth, N. J., manufacturers of metal powders, metal pigments and metal abrasives.

Mr. Collins, who has been a vice president of the company since 1953, has been in charge of sales of the organization's Metal Pigments and Metal Abrasives Divisions.

ROTO FINISH

it's the finish that counts!

Roto-Finish maintains exact tolerances on precision parts with no significant dimensional changes. It makes possible a wide range of finishes applicable to parts of almost any size or shape; finishes a variety of materials — at big savings in manpower and costs. Without obligation, send sample unfinished parts to us. Include finished part for guide and your specifications. Roto-Finish will finish parts in its laboratory. You get a complete process report. You are guaranteed results and a finish that counts!

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P. O. Box 988

Phone 3-5578

Originators of the Roto-Finish Process

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ZINC INSTITUTE RE-ELECTS F. S. MULOCK

F. S. Mulock has been re-elected president of the American Zinc Institute for a second term. Mr. Mulock is president of the U. S. Smelting Refining & Mining Co., Boston, Mass.

Also reelected for a second term at the April meeting of the Institute were three vice presidents: C. Merrill Chapin, Jr., St. Joseph Lead Co., New York City; R. G. Kenly, The New Jersey Zinc Co., New York City and E. H. Snyder, Combined Metals Reduction Co., Salt Lake City, Utah. Erle V. Daveler, American Zinc, Lead & Smelting Co., New York City, continues as treasurer and John L. Kimberley was re-elected executive vice president and secretary.

The following directors were elected for the term ending April 1959: K. C. Brownell, American Smelting & Refining Co., New York City; E. R. Dondorf, National Lead Co., New York City; Andrew Fletcher, St. Joseph Lead Co.; C. R. Ince, St. Joseph Lead Co., G. H. LeFevre, U. S. Smelting Refining & Mining Co., W. H. Leverett, National Zinc Co., Inc., New York City; E. S. McGlone, Anaconda Company, New York City; E. H. Snyder, Combined Metals Reduction Co.; S. D. Strauss, American Smelting & Refining Co., and Jean Vuillequez, The American Metal Co., Ltd., New York City.

DIXON SINTALOY PROMOTES TWO

Kenneth M. Gleszer has been appointed executive vice president and Anthony J. Zino, Jr., vice president in charge of sales for Dixon Sintaloy, Inc., Stamford, Conn., a subsidiary of Joseph Dixon Crucible Co.

Mr. Gleszer, who joined the company in 1952, had previously held enginering and administra-

A. J. Zino, Jr.

K. M. Gleszer

tive posts with Moraine Products Div. of General Motors Corp., Micro-Ferrocart Products Div. of McGuire Industries, and American Sintered Alloys, Inc. He has also served as consultant on powder metallurgy to Frankfort Arsenal.

Mr. Zino has held sales management positions with Lubri-Zol Corp., Swan-Finch Oil Corp., and E. F. Houghton & Co. before joining Dixon as general sales manager in 1951.

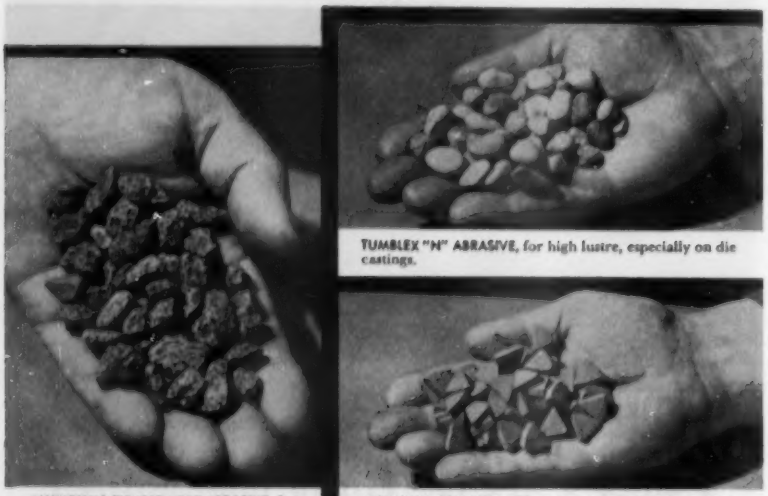
HOEGANAES APPOINTS NEW GENERAL SALES MANAGER

Robert R. Hendren of Riverton, N. J., has been appointed general sales manager of Hoeganaes Sponge Iron Corp., 545 Fifth Avenue, New York City, according to a statement of Gerald F. Finley, president.

Mr. Hendren is a graduate of Ohio State University with a degree in ceramic engineering. He is also a registered Professional

Robert R. Hendren

Engineer and holds several patents in the field of super refractory materials. He has been associated with Ferro Enamel Corp., Republic Steel Corp., and Richard C. Remmey Son Co.



ALUNDUM* TUMBLEX "A" ABRASIVE, for general barrel finishing

TUMBLEX "N" ABRASIVE, for high lustre, especially on die castings.

ALUNDUM TUMBLEX "T", a bonded, triangular shape tumbling abrasive for special or intricate shaped parts.

3 Norton TUMBLEX Abrasives are producing sensational results

First, check your present method of deburring and descaling. If it is slow and costly, it is quite likely that barrel finishing can do it better, faster and cheaper. Second, check the three Norton Tumblex materials shown above and decide if their properties would be suitable for your requirements.

Third, send your work samples to our newly enlarged Sample Processing Department. Let us prove to you how the latest barrel-finishing equipment and techniques can improve your product quality and cut your finishing time and costs. NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone directory, yellow pages. Behr-Manning, Troy, N. Y., a division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. G-309

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USEFUL LITERATURE CATALOGS, MANUALS

to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue

PROCESSES

Powder Metallurgy News: 154
The New Jersey Zinc Co.—four page external house organ. The metal powder press is published to give news about the industry and about new products being made from metal powders. Uses of brass and other non-ferrous powders are stressed.

Investment Casting Applications: 155
Arwood Precision Casting Corp.—four page, 2 color brochure. Nine different applications of the investment casting process in nine different industries are given. Advantages in design and production are emphasized.

Die Casting Facilities: 156
Accurate Die Casting Co.—40 page brochure, illustrated. The many different services and facilities of the plant are illustrated and discussed. Many applications of die cast parts are shown and described.

Shell-Molded Casting: 157
Crobalt, Inc.—two page bulletin. The production facilities for making both ferrous and non-ferrous shell molded castings are briefly described. Examples of production parts are given.

Economics of Investment Casting: 158
Humphrey Castings, Inc.—4 page leaflet, illustrated. In addition to showing photos of the steps in the investment casting process, this new piece of literature has an analysis of cost comparisons for a typical piece, as produced by four different methods, to define the range of maximum economy for investment castings. It also has an outline of facts for the engineering and purchasing departments.

MATERIALS & EQUIPMENT

Die Casting Die Components: 22
Detroit Mold Engineering Co.—four page brochure. Sprue bushings and sprue spreaders specially designed and nitrided for longer wear are discussed. The sprue bushings are all water cooled for longer life and faster cooling. Specially made tapered cutters for standard spreaders are also discussed.

Alloy Steel Goosenecks: 161
Dodge Steel Co.—one page bulletin. Special alloy steel goosenecks for longer service life with less maintenance are described. Increased life of from 4 to 5 years over plain or alloyed iron is claimed.

Special Cutting Oil: 162
Magnus Chemical Co., Inc.—one page, bulletin No. 137. A special cutting oil with about eight times the base content of general purpose oils. Recommended for stainless, aircraft and alloy steels.

Metal Sorter: 163
Brush Electronics Co.—one page catalog sheet ED 11706. Describes a metal sorter for ferrous or non-ferrous metals to sort mixed metals into homogenous groups. Differences as small as 1% carbon can be detected.

Tool Steel Stock List: 164
Uddeholm Co. of America, Inc.—44 page catalog. A complete listing of all compositions and all types and sizes of Swedish steels carried in stock in this country. Includes a steel suitable for die casting brass, as well as a series for zinc and aluminum.

Die Casting Machines: 52
Reed-Prentice Corp.—20 page illustrated catalog. The complete line of die casting machines, both hot and cold chamber units, is illustrated and discussed.

Iron & Steel Powders: 166
Metal Powders, Ltd.—nine page file folder. Separate data sheets for each of eight different iron or steel powders and a separate price list are included. Complete chemical and physical data on the powders are given.

Magnesium Alloys: 167
The Magnesium Association—ten page report. A report of the Magnesium Association Alloy Nomenclature and Temper Designation adopted at the 1955 meeting. ASTM, Federal AMS, SAE and company identifications are given.

Austenitic Stainless Steels: 168
Allegheny Ludlum Steel Corp.—ten page booklet. A part of the AL technical studies series, gives detailed information on chromium-nickel stainless steels of the 200 series (low nickel).

Foundry Equipment: 169
Crucible Manufacturers' Association—four page brochure on the advantages and possible production savings achieved through the installation of adequate ventilating systems in foundries.

Die Casting Lubricants: 170
Fiske Bros. Refining Co.—two data sheets. No. 231 die casting compound for producing cleaner smoother castings free of imperfections and discoloration and No. 514A hot die lubricant for forging operations are described.

Die Casting Machine: 171
Cleveland Automatic Machine Co.—eight page brochure. A complete description of the new model 400-N machine. This is a 400 ton machine for either hot or cold chamber operation.

Portable Drill Press: 172
Portomag, Inc.—4 page illustrated brochure. A description of a portable drill press with an electromagnetic base for working on any ferro-magnetic surface. Magnet has pull of up to 1900 lbs.

Die Sets & Die Makers Supplies: 173
Danley Machine Specialties, Inc.—200 page catalog. A complete description and listing of die sets and diemakers' supplies available. Drawings and technical information are included.

Cored Forgings: 174
The Weatherhead Co., Aviation Div.—six page brochure. A description of cored forgings and numerous examples of parts that have been made are given. Forgings as close to dimensions as ±0.002 are claimed.

Die Casting Machines: 175
American Die Casting Machinery Co.—four page bulletin. A description of the several different hot and cold chamber machines available. Complete specifications for each model machine are given.

Continued on page 60

Nationally known window manufacturer finds:

HONITE Method cuts finishing costs on aluminum die castings up to 96%

1. **COST CUT 96.3%** on trimming a base part for a jalousie window unit. Old hand method cost .0027¢ per unit: HONITE Method costs .0001¢ per unit.
2. **COST CUT 96%** on smoothing a jalousie window inner rail handle. Old hand grinding method cost .015¢ per unit: HONITE Method costs .0006¢.
3. **COST CUT 78%** on trimming a housing for a jalousie window unit. Old hand method cost .0055¢ per housing: HONITE Method costs .0012¢ per housing.
4. **COST CUT 96%** on polishing a cam handle for a jalousie window. Old hand grinding method cost .015¢ per unit: HONITE Method costs .0006¢.

You can cut costs with the Honite Barrel Finishing Method, *too!*

Minnesota Mining and Mfg. Co.
Dept. FF-56 St. Paul 6, Minn.

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☐ I'd like to talk with a HONITE Field Engineer

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Honite BRAND — PRODUCT OF 3M RESEARCH

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USEFUL LITERATURE
Continued from page 59

Metal Powders: 176
American Metal Co., Ltd.—six page illustrated report. A general description of the facilities for research into powder metallurgy and metal powders.

FINISHING

Abrasive Materials: 179
Abrasive Engineers—16 page catalog and added price sheet. A detailed description of the abrasive and lapping compounds, stick abrasives and stones is given.

Blast Cleaning: 180
Pangborn Corp.—4 page brochure. A description of the AC-3 blast cleaning machine recommended for general purpose and maintenance cleaning.

Barrel Finishing: 181
BMT Mfg. Corp.—8 page descriptive catalog. A complete description of a multi-barrel finishing machine that combines both sliding and rotating action. A wide variety of parts, both as to size and kind, can be processed at the same time.

Drilling & Tapping Heads: 182
The Govro-Nelson Co.—8-page bulletin. A description of the standard drilling and tapping heads, with overall dimensions. Also illustrations of a number of different applications to special machines.

Metal Cleaning: 183
Metalwash Machinery Corp.—8 page external house organ. Case histories of metal cleaning equipment installed in production lines for a wide variety of different products.

Machine Tool Collets: 184
Sutton Tool Co.—4 page bulletin No. 10. A listing of the collets in stock for lathes, milling machines, and grinders. Prices and capacities are given.

Solvent Detergents: 185
Oakite Products, Inc.—6 page folder. A description of composition No. 98. A product designed to simultaneously clean and protect metal against rust.

Nickel Plating Instruction Manual: 186
Hanson-Van Winkle-Munning Co.—a 20 page instruction manual. A comprehensive manual on bright nickel plating. Bath compositions and operating instructions are given in detail. Solution control, maintenance and analysis are fully covered.

Hydraulic & Pneumatic Cylinders 187
The Tomkins-Johnson Co.—six page reference bulletin. A description and specifications of the 15 different styles of both air and hydraulic cylinders made by the company. Complete dimensions and operating specs. are given.

Spray Painting Machine: 188
Conforming Matrix Corp.—two page brochure. A complete description of a new automatic rotary gun spray painting machine and an automatic wiping machine. The equipment is reported specially good for round and deep drawn parts.

End Mills for Aluminum and Alloys: 189
Putnam Tool Co.—descriptive brochure. A new brochure providing catalog numbers, dimensional data and prices for a new line of end mills that have been specifically designed for machining aluminum and aluminum alloys.

Continued on page 62

How to... DEBURR THESE INACCESSIBLE HOLE FACES BY MACHINE OPERATION

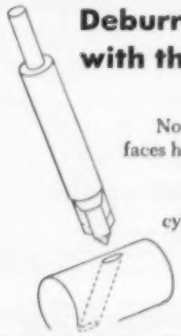
- faster
- better
- easier

with the amazing NOBUR TOOL

No more hand-finishing methods for those hard-to-get-at inner surfaces on multi-wall parts. The NOBUR Tool with its double edge cutting blade does the job in seconds . . . all by *machine operation*. Can be used by anyone, with complete safety, on your own lathe, drill press, etc. Simple to operate.

1. Insert NOBUR tool in any machine spindle. A light pressure of the revolving cutter-blade against the workpiece quickly deburrs the outside surface.
2. After outside surface is deburred, slide, knurled-sleeve back to fully retract the cutter-blade below pilot body diameter.
3. With cutter-blade retracted move workpiece, or tool to position for deburring inside surface. Raise (project) cutter-blade and advance tool or work piece to deburr first one surface then the other.

HERE'S ANOTHER PROBLEM SOLVED



Deburring Elliptical Holes with the *NEW!* ELLIPTI-BURR TOOL

Now . . . deburr openly accessible hole faces having an irregular surface like those developed when holes are drilled angularly or when drilled through cylindrical bodies. This revolutionary tool is self-piloting with a two-lipped cutter that automatically follows the hole surface geometry. Write for full data.

Write for FREE Folder

Send for all the details on Nobur Tool Products — the key to *lower* costs, *higher* production and *improved* quality on your deburring operations. WRITE TODAY!

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HAVE YOU TRIED THIS EXTRAORDINARY CLEANER?

Oakite Rustripper removes rust and heat scale in the same operation that removes oil. Avoids hydrogen embrittlement, damage to machined surfaces, other disadvantages of acid pickling.

Have you taken the four good steps?

How can cleaning costs be reduced 33% while cleaning quality is being improved? *See pages 7 and 8 in the booklet.*

What are four easy ways to improve the average rinse tank? *See page 10.*

What causes hydrogen embrittlement during electrocleaning? What is the remedy? *See pag s 15 and 16.*

Do you need a brass cleaner that gives better protection against tarnishing?

Oakite has a new brass cleaner that provides scientific protection against the oxygen that tarnishes brass and other copper alloys during the application of reverse current.

"It cut our cleaning rejects by more than 90%"

says a manufacturer who found that Oakite Composition No. 95 gave him:

BRIGHTER PLATING—All films removed . . . no residues, no undersurface shadows, no anodic blackening, nothing to impair the brightness of the electroplate.

FEWER REJECTS—Major causes of blistering and peeling eliminated . . . Consistent success in baking for 60 minutes at 300°F.

OAKITE PRODUCTS, INC.
340 Rector Street, New York 6, N. Y.

Send me the FREE booklets indicated below:

- ☐ Here's the best shortcut in the field of electroplating
- ☐ Four good steps toward better electroplating on steel
- ☐ What's NEW for electrocleaning brass and other copper alloys
- ☐ Good news about electrocleaning zinc-base die castings

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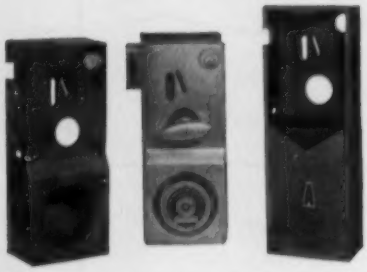
OPC PLASTER
These ~~permanent~~ mold castings
save time and money



The Nik-O-Lok Co., Indianapolis, eliminated an entire production operation and cut machining time to a bare minimum by using OPC silicon bronze castings for its lock cases. Formerly, the back plate was a separate piece, (A), welded to the case; OPC produces this four-sided casting in a single piece, ready for final finishing and assembly.

Intricately detailed castings, smoothly finished to the most exacting tolerances, are standard at OPC. Our new brochure will give you plenty of ideas for making notable savings on your small parts—write for your copy today.

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P.O. Box 55-A • • • • DAYTON 3, OHIO
Plaster Mold Castings made from
BRASS • BRONZE • ALUMINUM • BERYLLIUM COPPER

USEFUL LITERATURE — Continued

Spindle Stands for Polishing: **190**
Grinding & Polishing Machinery Corp.—4 page bulletin No. 106. A complete description of both the rigid spindle and universally adjustable spindle polishing stands.

Parts Driers: **191**
New Holland Machine Co.—4 page illustrated brochure. Descriptions and illustrations of the Model 20 small parts drier. Complete physical specifications of the drier are given.

Finishing Barrels: **192**
Rampe Mfg. Co.—4 page brochure on replacement barrels. A description of a line of precision finishing barrels ranging in size from 1 gallon to 8 cu. ft. capacity. Units are designed for replacement on existing machines or for shops that build their own tumbling machines.

Polishing Head: **193**
Grinding & Polishing Machinery Corp.—new illustrated brochure. A brush-backed polishing head for sanding, polishing, deburring and other finishing operations is described.

Diamond Wheel Bond: **194**
Clipper Diamond Tool Co., Inc.—illustrated brochure. A description of a new bonding material for making up diamond wheels.

Data Folder on Surfacants: **195**
Carbide & Carbon Chemicals Co.—40 page data book. The general properties of surface active agents, their applications, physiological properties, performance data, testing methods and other basic information are all given.

Continued on page 64

New Pangborn Hydro-Finish
solves such cleaning problems as:
* deburring * surface finishing
* finishing threaded sections
* improving cutting tool life
* maintaining dies and molds
* removing grinding lines
* removing heat treat scale
* preparing surfaces

Pangborn has redesigned the Hydro-Finish for added efficiency and easier handling. *Originating the use of air jet sluriators to eliminate pumps,* the new Hydro-Finish represents a lower investment as well as a lower maintenance cost. Optional equipment simplifies overall operation. Investigate Pangborn Hydro-Finish now!

For full details, send for Bulletin 1403, now! Write to: PANGBORN CORPORATION, 3500 Pangborn Boulevard, Hagerstown, Maryland. *Manufacturers of Blast Cleaning and Dust Control Equipment.*

Pangborn
BLAST CLEANS CHEAPER

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OPPORTUNITIES

Address all Box Number Inquiries care of Precision Metal Molding magazine, 812 Huron Road, Cleveland 15, Ohio.

INDIANA'S LEADING MANUFACTURERS' REPRESENTATIVES seeking high grade aluminum and zinc die casting connection. Plating facilities essential. Must be competitive. We cover all volume accounts in Indiana. Kentucky and Tennessee optional. Write Box No. 5156.

FOREMAN—PRECISION CASTINGS—LOST WAX PROCESS — Experienced in wax pattern making, investing and pouring of metals. Excellent future with expanding company. Salary plus employee benefits. Send resume or reply to Box No. 5256.

NEEDED—4 new or used aluminum base alloy cold chamber die casting machines. Cash or terms. Write Box No. 5556.

ONLY THE BEST — We need competent metallurgist who likes people — therefore enjoys success in technical sales; who knows ferrous melting; who likes to guide his own destiny — therefore aspires to management; who is resourceful, imaginative, creative—therefore above average. Knowledge of tool, stainless, superalloys desirable. Home base will be Detroit area. Tell us about yourself and we'll do the same. WaiMet, 1999 Guoin, Detroit 7.

SALES ENGINEER of ferrous investment castings for large company with casting headquarters in East. Must be familiar with technical aspects of investment castings and some sales experience desirable. Excellent opportunity with progressive, well diversified company. Write resume of qualifications, experience and present salary to Box No. 5456.

APPOINT WESTERN REPS

Antara Chemicals, a sales division of General Aniline & Film Corporation has appointed the Denver Fire Clay Company located at 2301 Blake Street, Denver, Colorado, as the distributor for its products in Colorado, Wyoming, Montana, Utah, Idaho, New Mexico and Western Texas effective April 1, 1956.

now you can get this brilliant finish directly on zinc die castings!

PART AS CAST

No electroplating—no mechanical finishing!

TREATED WITH NEW IRIDITE

NEW IRIDITE® (Cast-Zinc-Brite)

brightens zinc die castings by chemical polishing, protects against corrosion

NOW, FOR THE FIRST TIME you can get a brilliant, decorative finish directly on zinc die-cast parts . . . without mechanical finishing, without electroplating! The luster is provided by the *chemical polishing* action of new Iridite (Cast-Zinc-Brite) solution. Even surface blemishes, such as cold shuts, are brightened by this new process. No electrolysis. No special equipment. No specially trained personnel. Just a simple chemical dip for a few seconds and the job is done. And, this new Iridite has been *tested and proved* in production.

CORROSION RESISTANCE, TOO! New Iridite (Cast-Zinc-Brite) provides exceptional corrosion resistance for bright-type chromate finishes . . . also guards against blueing or darkening by eliminating zinc plate formerly required in bright chromate finishing of zinc die castings.

AS A BASE FOR ELECTROPLATING—Lower mechanical finishing costs are possible where plated finishes are *required* since the brightness provided by this new Iridite may be sufficient.

LET US SHOW YOU what Iridite (Cast-Zinc-Brite) can do for you. Send us at least a half-dozen typical zinc die-cast parts for FREE PROCESSING for your own tests and evaluation. Or, for immediate information, call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified 'phone book. *IMPORTANT: when you give us samples for test processing, please be sure to identify the alloy used.*

Iridite is approved under government specifications

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Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals; ARP Plating Chemicals

For more information circle No. 60 on the Reader Service Card

For more information circle No. 74 on the Reader Service Card

Can your tapper pass this Performance Test?

(CHECK IF "YES" ONLY)

- ☐ Maintains production for long periods
- ☐ Less operator fatigue
- ☐ Fewer broken taps
- ☐ Less "down time" interruption
- ☐ Fewer spoiled pieces
- ☐ Maintains accuracy at high speeds

If You Cannot Answer Yes to Each of the Above... Your Tapper is Not Operating Efficiently

There is a difference in tapping heads and in Procunier you'll find that unmistakable difference. If your tapper is not producing up to par—regardless of your demands and schedules—it will pay you to check into the possibility of using Procunier. They have been consistently producing "profitably" under "back breaking" production schedules everywhere!

Procunier superiority can be attributed to many unique construction features: practical double cone cork faced friction clutch, wobble free spindle, quick start, stop and reverse mechanism, finger tip control, exclusive tap holder, plus others. Get the full story today.

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giving the full Procunier Story. It's yours for the asking

PROCUNIER SAFETY CHUCK CO.
14-16 S. Clinton St., Chicago 6, Ill., Dept. 5

USEFUL LITERATURE — Continued

Surface Alloying with Chromium: **196**

The Chromalloy Corp.—reprint on chromallizing process. A short description of the process and the advantages for corrosion and wear resistance. Some suggested applications are also given.

Air Control Valves: **197**

The Valvair Corp.—6 page folder. The bulletin describes, in detail, the operation, uses, optional features, etc. of the single and double solenoid valves. A table of service pressure ranges, condensed specifications and dimensions is included.

Small Parts Painting Machine: **198**

Conforming Matrix Corp.—2 page brochure. A description of a new automatic oscillating gun pressure contact painting machine. The unit is described as useful for small parts with painting areas up to 6" x 8".

Metallic Cleaners: **199**

Hanson-Van Winkle-Munning Co.—4 page bulletin. A data sheet on the application of cleaners in preparing metallic surfaces for electroplating, anodizing, painting and other surface finishes. A reference chart giving recommended cleaners for different metals and alloys is included.

Automated Barrel Finishing: **200**

Almco Div., Queen Stove Works, Inc.—12 page bulletin. A complete description of the fully automatic, skip station Sub-O-Matic barrel finishing systems.

SERVICE *IN ALL MELTING PROBLEMS WHERE FLUXES ARE USED*

PROVEN *USED BY DIE CASTING PLANTS FOR MORE THAN 15 YRS.*

New **SMOKELESS ZINC FLUX** *LATEST DEVELOPMENT*

ZINCOREX "DT"

has been improved to give your metal more fluidity and to prevent sluggishness. Zincorex "DT" does away with obnoxious ingredients, will not absorb water, reduces fumes. Application of Zincorex "DT" gives you:

1. increased fluidity of metal
2. lower rejects and faulty castings
3. savings of metal (retained free of dross)

ALUCO "S"

is designed specifically for die casting aluminum base metals. With it, you can be sure of: reduced oxidation; removal of non-metallic inclusions; sound castings with minimum rejects.

Write for free samples and technical data.

Atlantic Chemicals & Metals Co.
1921-27 N. Kenmore Ave. • Chicago 14, Illinois

Circle No 11 on Reader Service Card

MAKE PRECISION ALLOYS IN AJAX INDUCTION FURNACES

At the Edmore, Michigan, foundry of General Electric's Carboloy Department, all the critical Alnico alloys are made in Ajax-Northrup induction furnaces.

Electromagnetic fields stir the molten metal, rapidly distributing every element of the charge throughout the melt. There's no contamination, and scrap is almost 100% recoverable. Temperature and melting speed are easily controlled by varying power to the furnace.

No wonder industry continues to choose Ajax-Northrup induction heat—as it has for forty years—for every type of melting installation. Write Ajax Electrothermic Corporation, Trenton 5, New Jersey, for details.

Associated Companies: Ajax Electric Company—Ajax Electric Furnace Co.—Ajax Engineering Corp.

AJAX NORTHRUP SINCE 1916

INDUCTION HEATING-MELTING

For more information circle No. 4 on the Reader Service Card

CLEPO
METAL FINISHING CLEANERS AND PROCESSES

CLEANERS and BARREL TUMBLING METHODS

THAT *Have Won Approval* of Die Casting Finishers

Cleaning and barrel tumbling are important operational steps. They must rank high in your thinking because they are so important in the overall finishing picture. CLEPO Products have much to offer you in quality and effectiveness; and what is equally important, economy.

Why not get acquainted with CLEPO Products? Send for our General Catalog on Cleaners, Barrel Tumbling Compounds, and other products. If you have a problem that is bothering you now, ask to have our field service man call. Or send samples to our laboratory for study and tests.

Serving industry in this way has been our business since 1933

FREDERICK GUMM *Chemical Company Inc.*

538 FOREST STREET, KEARNY, N. J.

Circle No. 64 on the Reader Service Card

McMILLEN ELECTED TOOL ENGINEERS PRESIDENT

Howard C. McMillen, Bedford, Indiana, has been elected president of the 33,000-member American Society of Tool Engineers to succeed Dr. Harry B. Osborn, Jr., of Cleveland, Ohio. McMillen is plant manager of Philco Corporation's Bedford, Indiana plant. Osborn is technical director of TOCCO Division, Ohio Crankshaft Company.

Other society officers elected are: H. E. Collins, manager, Process Engineering Department, Hughes Tool Company, Houston, Texas, first vice president; G. A. Goodwin, chief process engineer, The Master Electric Company, Dayton, Ohio, second vice president; Wayne Ewing, president Arrowsmith Tool and Die Co., Inc., Los Angeles, California, third vice president; H. Dale Long, president, Scully-Jones & Company, Chicago, fourth vice president; John X. Ryneska, manager of purchasing; General Electric Company, West Lynn, Mass., treasurer; and William Moreland, vice president, Meyers Pump Co., Ashland, Ohio, secretary.

Circle No. 73 on the Reader Service Card

ON EVERY POROUS CASTING
THROUGH
WASTED MATERIALS
ASSEMBLY COSTS
MACHINING TIME
PRODUCTION LAGS

WESECO Impregnant P. E. #1 will increase your profits by eliminating all porosity in your castings. Plants in all principal cities. Send for brochure #21.

WESTERN SEALANT COMPANY
9999 WEST JEFFERSON BOULEVARD
CULVER CITY, CALIFORNIA

NEW!

HIGH SPEED A.B.C. DIE CASTING MACHINE

Free Cycles Over 1000 Shots Per Hour

Here's the new A·B·C high speed, low cost die casting machine which eliminates costly production of small die castings on large die casting machines. Air operated, the machine produces small non-porous lead, tin and zinc alloy precision die castings up to 1½ lbs.

The A·B·C is economical to operate and easy to set up. Its lightning production speeds makes single cavity molds practical and profitable.

STANDARD EQUIPMENT INCLUDES:
- 4 TIE BARS
- AUTOMATIC TIMING
- CALIBRATED TEMPERATURE GAS CONTROL
- GAS BURNERS
- DIE BLOCKS
- AIR REGULATOR
- FILTER
- OILER
- SAFETY SHOT INTERLOCK

Write today for engineering data and prices. Ask for bulletin A-10.

A B C DIE CASTING MACHINE CO.
400 E. 142nd ST. • DOLTON, ILL.

For more information circle No. 1 on the Reader Service Card

The abbot and the Million Shiny Buckles

The *abbot* studied the small watchband buckles. Each was stamped from stainless steel with nicely defined, square corners, evenly spaced decorative ridges and precisely placed pinion holes.

The little man's visitor wore a worried frown. "How," he asked, "can we put a good, shiny finish on a million of 'em, quickly and economically?"

In less than a week, the *abbot* mailed his meticulously typed reply. "Your watchband needs burnishing," he wrote; "Try barrel burnishing with Abbott 3/16" Diagonals. You'll find they are shaped to do the job right. Besides, the Abbott Method is fast, economical and thorough."

Abbott Burnishing Materials make efficient and uniform contact on metal parts and castings of every size and shape. Made from selected carbon steels, they are Deep Hardened with a glass-hard, mirror-like finish. Combined with the Abbott Vertical Barrel, they make the *perfect* barrel finishing combination.

Let the abbot show you how The Abbott Method can help you. Just drop a line to . . .

ABBOTT

The ABBOTT BALL Company

1084 New Britain Avenue
Hartford 10, Conn.

Circle No. 59 on the Reader Service Card

PATENTS
continued from page 27

composes it on the article being plated in a single continuous operation. An excess of carbon monoxide is used as a carrier gas and is constantly recirculated along with the carbon monoxide released by the decomposition of the nickel carbonyl.

(Patent No. 2,731,361—Catalyzed Decomposition of Metals from the Gaseous State—Herman R. Nack and John R. Whitacre — assigned to The Commonwealth Engineering Co. of Ohio—issued Jan. 17, 1956—5 claims.)

A METHOD OF REDUCING the shrinkage defects in castings in which a definite content of gas is dissolved in the molten metal just prior to pouring. This gas is released, chemically unchanged, when the metal solidifies. The gas is metered into the molten metal by bubbling gas through the metal until the amount of gas leaving the molten metal is equal to the amount of gas being introduced. Bubbling of the gas is continued until the moment of pouring.

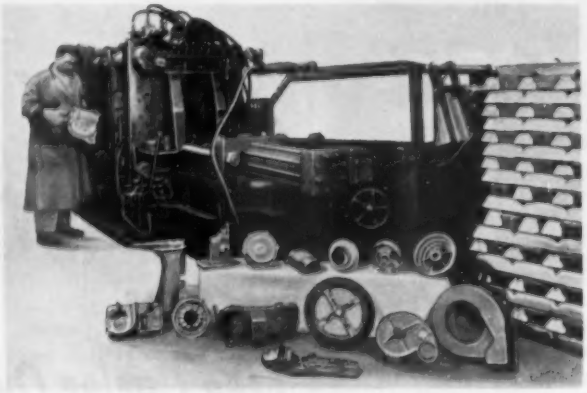
(Patent No. 2,724,160—Method of Reducing Shrinkage Defects in Metal Castings—Ernst Scheuer—assigned to Alloys, Ltd.—issued Nov. 22, 1955—2 claims.)

A SHELL MOLD whose walls are composed primarily of refractory inorganic grains, substantially free from any inorganic bond. The individual grains are coated with a first layer of a polarized wetting agent and a second layer of a resinous bond superimposed on the first layer. The resinous material has an opposite polarity to the wetting agent and is compatible with it. The wetting agent serves to intensify the bonding power of the resin.

(Patent No. 2,730,541—Shell Mold and Composition for Making Same —Burgess P. Wallace and Van Dyke Rommey—assigned to Whitehead Brothers Co.—issued January 10, 1956—8 claims.)

AN APPARATUS FOR CHARGING powdered materials into containers which comprises an outer conical feeder with a bottom opening defined by the diameter of the container being filled. An inner conical feeder provided with a plurality of laterally spaced feeders so that measured amounts of different materials can be fed separately or simultaneously into the container.

(Patent No. 2,730,283 — Charging Reduction Containers for the Production of Sponge Metals—Sven



A solution to your casting problems may be in this group of large and intricate zinc and aluminum die castings.

Our casting capacity, as represented by one of our many large machines, can produce larger castings than those shown here.

Our vast experience may end your present casting problems.

FEDERAL DIE CASTING CO.

2220 N. ELSTON AVE. CHICAGO, 14, ILL.
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For more information circle No. 25 on the Reader Service Card

Emil Sieurin and Edvin Verner Olsson—assigned to Hoganas-Billesholms Aktiebolag—issued Jan. 10, 1956—11 claims.)

AN ELECTROLYTIC BATH for forming a coating on magnesium and magnesium alloys. The bath contains from 1 to 60 g/1 of either sodium or potassium manganate, 1 to 300 g/1 of anhydrous sodium or potassium fluoride, 10 to 300 g/1 of sodium or potassium phosphate, 20 to 130 g/1 of sodium or potassium hydroxide and from 1 to 125 g/1 of aluminum hydroxide, potassium aluminate or sodium aluminate.

(Patent No. 2,723,952—Method of Electrolytically Coating Magnesium and Electrolyte Therefor,—Harry A. Evangelides—issued Nov. 15, 1955—21 claims).

A CEMENTED CARBIDE COMPOSITION consisting of from 40 to 95% by volume of tungsten carbide in which over 50% of the carbide constituent is crystals larger than 20 microns. A binder comprising from 5 to 60% by volume chosen from the group of cobalt, nickel, iron or mixtures of them.

(Patent No. 2,731,711—George W. Lucas—assigned to the General Electric Co.—issued Jan. 24, 1956).

A TABLETTING PRESS having a die cavity and a plunger for compressing powdered material. A method is provided for reciprocating the plunger through a compression and return stroke and control means to hold the plunger in any given position within the die cavity so as to allow expansion of the compressed material after compression. A means is also provided for automatically restarting the plunger return stroke from the point of dwell after a predetermined time interval.

(Patent No. 2,724,145—Tabletting Machine—Keith W. Hall—assigned to Baldwin-Lima-Hamilton Corp. —issued Nov. 22, 1955— 4 claims.)

THE PRODUCTION OF LOW SILICA IRON POWDER by mixing iron oxide with finely divided carbonaceous material of a larger grain size than the iron oxide, the carbonaceous material is substantially 100% plus-80 mesh. The mixture is heated to a sufficient temperature and for a sufficient time to effect reduction of the iron oxide to metallic iron. Following reduction the sponge formed is cooled, ground to the desired particle size and then magnetically separated from any gangue material present.

(Patent No. 2,728,655—Method of Producing Iron Powder With a Low Silica Content—Nils Herman Brundin—assigned to Hoganas—Billesholms Aktiebolag—issued Dec. 27, 1955—3 claims.)

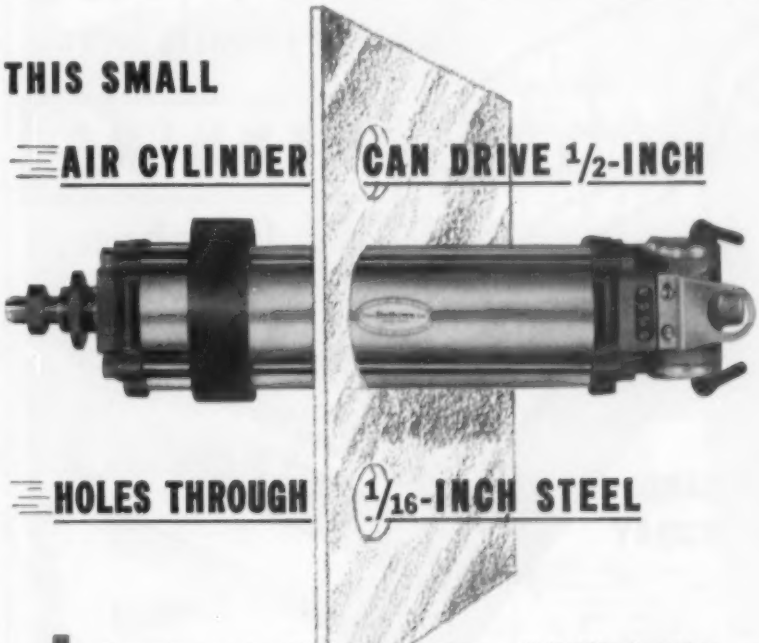
TITANIUM POWDER
continued from page 40

million, it tends to reduce ductility without affecting tensile strength. In alpha alloys, increasing hydrogen content reduces impact strength by forming increasing amonuts of an insoluable titanium hydride. Hydrogen is eliminated in production by the use of vacuum melting and can also be removed by annealing in vacuo.

Titanium powder metallurgists have principally been concerned with making parts of commercially pure titanium. By powder metallurgy it has been possible to produce metal which has tensile strength, notch sensitivity and impact strength equivalent to commercially pure titanium.

The chief difficulty in producing ductile products of titanium of theoretical density has been the production of powder which is low in interstitial alloy content, since as the fineness of the comminuted powder, and concomitantly its surface area, increases, titanium reacts more readily with air at room temperature and so becomes embrittled. Available data indicates that this difficulty has been overcome by the Brush Development Co. division of the Clevite Corporation. The more detailed aspects of the powder metallurgy of titanium will be presented in the next of this series in June PMM.

THIS SMALL AIR CYLINDER CAN DRIVE 1/2-INCH HOLES THROUGH 1/16-INCH STEEL



An ordinary air cylinder of 2½" bore will hardly dent the same piece of steel. But the Bellows Super Speed Air Motor can punch through it at only 100 psi. air line pressure.

That's why the Super Speed is an ideal answer to many staking, forming, riveting, stamping, coining, swedging, cut-off, and similar problems. Try it the next time you need high speed and power! It's faster and more economical.

Super Speeds are available with built-in manual, electric, or pneumatic control valves. Standard stroke lengths are: 2", 4", 6", 9", and 12".

We'll gladly send you a bulletin giving full details, including an explanation of why the Super Speed has more speed and power than ordinary cylinders. WRITE DEPT. PMM-556

The Bellows Co.
AKRON 9, OHIO

For more information circle No. 61 on the Reader Service Card

BERYLLIUM COPPER CAMS
continued from page 44

unstressed, they are subject to somewhat more wear than the others. Further it is necessary for some machining to be done prior to assembly and this cannot be done by the vendor. The castings are made in beryllium copper as before but are solution annealed and are not hardened. After machining, an age hardening treatment is given them to secure a minimum hardness of 35 Rockwell "C".

Of interest is the fact that these last two investment castings mentioned were the first ones to be used by Toledo Scale Co. and were first used about three years ago. Since that time, more investment castings have been used wherever possible so that today about twenty different items are made in this manner and the list is continually growing.

While the reasons given for the use of beryllium copper investment castings all relate directly to either per piece costs or decreased assembly costs, there are other reasons for using investment castings that are equally cogent. For example, consider again the assembly shown in Figure 2. By the former method of manufacture, it was necessary to stock and inventory raw, fastening devices, and in many cases individual components that would ultimately go into a single assembly. With an investment casting, the only stock that must be maintained is the finished part ready for assembly. Thus the inventory carries one part instead of five or six different parts.

Again consider the inspection load. Because three different pieces were separately machined, it was necessary to inspect each part prior to assembly and then give a final inspection after the assembly was completed. Further, tool wear and misalignment during assembly made it impossible to utilize minimal inspection under a standard quality control program. With investment castings, the uniformity from casting to casting is so good that the minimum statistical quantity of 2 percent is adequate for inspection.

Since inspection is usually an overhead item, it is difficult if not impossible to translate the costs to a per piece item cost. However, any reduction in the number of pieces inspected has an immediate reflection in the over-all cost of producing a finished article.

The fact that minimal inspection is adequate, reflects a further important factor—the number of rejected parts has been reduced. Were this not true, it would be necessary to inspect a higher percentage of parts under any good quality control program.

The cam shown in Figure 2 is used as was noted to drive the ticket indexing and cutting mechanisms. In these two operations, other investment castings also used; these are shown in Figure 4, and are linkage members.

The knife link, Figure 4a, drives the knife that cuts off the individual tickets from the roll. The first design called for this link to be machined from wrought steel stock with a drill rod pin pressed into a drilled hole. To simplify the casting, all dimensions were opened to the maximum tolerance and in many cases are as much as ± 1/64. In only two cases, the two holes, is a tight tolerance held and here reaming is necessary to meet

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for your copy of this compact, conveniently arranged booklet. It will save you money . . . and there's no cost or obligation, of course.
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Find out how Henning alloys can help you get better results at lower cost from this informative booklet. It's packed with facts about the Zamak alloys that can meet your needs precisely . . and designed to help both die casters and design engineers make the most of the most modern metal.
All ingots produced under laboratory control.
"Dependable service since 1922"
HENNING BROS. & SMITH, INC.
91-117 Scott Ave. at Randolph St., Brooklyn, N. Y.

the ± 0.001 requirement. The link is cast in beryllium copper and hardened to 28-32 Rockwell "C". Finish is not of great moment on this piece so that normal commercial surface finish for an investment casting is adequate.

As in the case of the drive cam, accurate engineering estimates of manufacturing costs clearly indicated that an investment casting, furnished complete by the vendor, would be far more economical than the older fabricating methods.

The other link shown in Figure 4b is used to index the tickets from the roll. It operates from the same cam assembly as the knife link and at the same frequency of operation, that is 20 to 25 cycles per minute maximum. In this case, however, certain of the thickness dimensions must carry tolerances that the vendor cannot meet in the as-cast condition. He therefore grinds or mills, depending on whether an inside or outside face is involved, to bring the casting to exact size. As before, the holes must be reamed to size.

This link is also cast in beryllium copper and age hardened to 28 to 32 Rockwell "C".

MODERN STOVE
continued from page 48

As a stamping, the lettering was raised to an apex — leaving its two sides in contact with the stove. Made of thin material, the stampings often became bent in storage and in handling so that many were rejected because they could not provide the tight fit desired.

But even when proper fit was obtained, the stampings lacked the substantial appearance now achieved with solid material produced by die casting. Also, the die cast plates do not become damaged in storage and handling.

The plates are cast with pins on their reverse sides. In attaching the plates, the pins are pushed through holes that have been die-stamped into an upper panel of a stove, and are held there with speed clips.

CHANGE CHICAGO OFFICE

The Hydraulic Press Manufacturing Co. has announced a change for the Chicago office. The new address is 911 Busse Highway, Park Ridge, Illinois. Phone Talcott 3-3136.

FORM SILICONES DIVISION

Silicones Division, Union Carbide and Carbon Corporation, has been formed to take over the responsibility for the development, manufacture, and sale of silicone products, it has been announced by Morse G. Dial, Union Carbide's president. Mr. Dial stated that the formation of the new Division reflects the expansion of the Corporation's activities and its interest in the fast-growing field of silicones.

This new Silicones Division will assume responsibilities in the field of silicones previously handled by Linde Air Products Company. Silicones, which have been marketed under the "Linde" trade-mark, will now be called "Union Carbide" Silicones.

William B. Humes, whose previous assignment was as vice-president of Union Carbide Canada Limited, has been appointed president of the new Division. T. J. Coleman, formerly general manager of the Linde Silicones Department has been named general manager of the new Division.

Light and Tough
FOR HEAVY DUTY SERVICE
ALUMINUM MOTOR HOUSING FOR TRUCK AXLES
Here is a typical Accurate die casting which is subjected to strain and rough usage under adverse operating conditions. Minimum weight and maximum strength are combined to assure long life and top performance in this motor housing for Eaton's Famous 2-speed axle Electric Shift. You too may be able to save time and money and get the production you need when you want it with an "Accurate" die casting.
Bring your design and production problems to our Engineers. Write or wire today for prompt service.
ALUMINUM • ZINC • MAGNESIUM DIE CASTINGS
ACCURATE DIE CASTING CO.
3089 E. 80th STREET • CLEVELAND 4, OHIO

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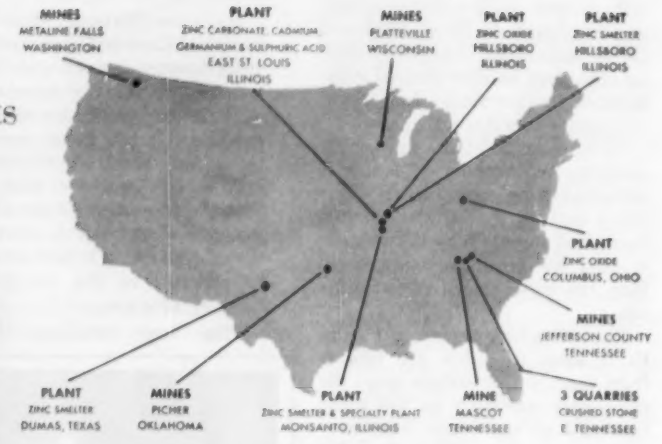
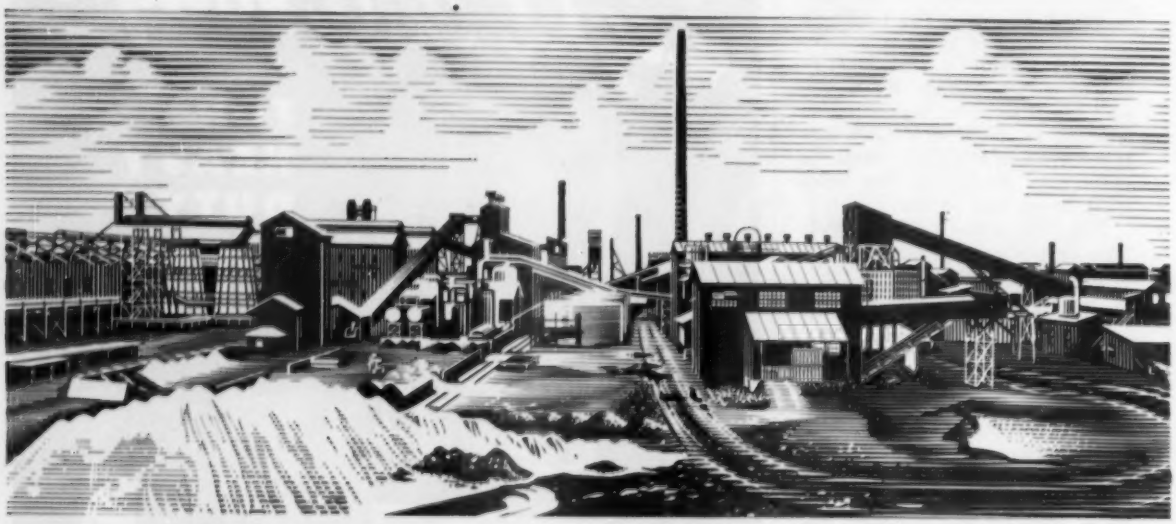
American Zinc and its products *from A to Z*





FAIRMONT CITY, ILLINOIS
(East St. Louis)

Operations include: roasting and sintering of zinc concentrates; cadmium plant producing commercial balls, sticks and plates; zinc carbonate plant; germanium plant producing germanium dioxide for the electronics industry. Sulphuric acid is produced by both the Chamber and Contact methods. For complete picture of American Zinc operations, see map above.

PRODUCERS OF

ALL GRADES OF SLAB ZINC
ZINC ANODES (Plating & Galvanic)
METALLIC CADMIUM
SULPHURIC ACID
LEAD-FREE and LEADED ZINC OXIDES
ZINC CARBONATE
GERMANIUM DIOXIDE
AGRICULTURAL LIMESTONE
CRUSHED STONE

Distributors for

American Zinc sales Company

AMERICAN ZINC, LEAD & SMELTING COMPANY

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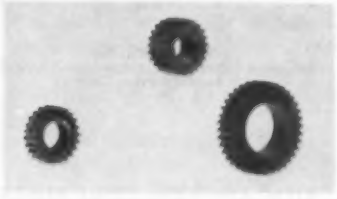
to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue

PRODUCT NEWS AND DEVELOPMENTS

HIGH STRENGTH, PRECISION GEARS FROM IRON POWDER



Recently announced, AGMA commercial class 4 and precision class 1 spur gears made from iron powder are now available.

According to the manufacturer, these gears when carburized, duplicate the physical properties of most production steels.

Through the use of highly accurate dies, uniform accuracy through a production run is assured. Thus gears can be made with the inherent economy of powder metallurgy without sacrificing either precision or strength.

Because tooth surface finish is equivalent to a ground finish, these gear units run more quietly, and efficiently. Gears up to one square inch in cross section can be produced, with each gear made to specific requirements.

Globe Industries
Supermet Div.
For more information, circle No. 205 on the Reader Service Card

SERIES OF THREADED INSERTS FOR THIN MATERIAL

For those applications where wall thickness will not permit the use of standard threaded inserts a new short series has been developed. The usual ratio of length to diameter for these inserts is 1½ to 1 while the new series has a ratio of 1 to 1.

Like the regular threaded inserts, the short series is made for use in relatively soft materials such as aluminum, zinc and magnesium as well as plastics where repeated assembly and disassembly would cause undue thread wear or where critical tensile stress conditions are encountered.

The use of threaded inserts in such materials as aluminum and magnesium alloys permits the casting of smaller bosses and the use of thinner wall sections, thereby decreasing overall weight. The new series of inserts is available in hardened steel, stainless steel and brass.

Groov-Pin Corp.
For more information, circle No. 206 on the Reader Service Card

AUTOMATIC DRILL FEED ATTACHMENT ADDS SKIP DRILLING OPERATON

A new attachment has added skip drilling as a standard operation of the automatic multi-speed drill feed attachment for drill presses.

With the new device a full cycle includes a fast approach, then drilling at a set speed and feed and depth, a second rapid approach and again a set cycle of speed, feed and depth. Adjustments establish the lengths of approach and drilling speed.

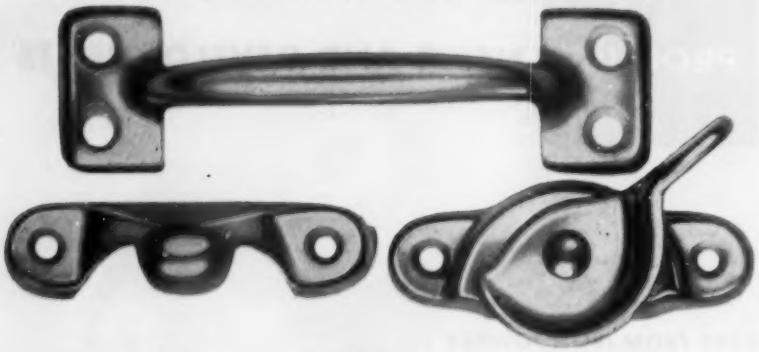
Other production jobs which can be handled by a drill press converted to an automatic by the multi-speed drill feed are drilling, tapping, reaming, threading, counter-boring, spinning, spot facing, fly cutting, and many others.

The new unit is air operated and hydraulically controlled. Adequate adjustments for all types of work are provided.

General Pacific Corp.
For more information, circle No. 207 on the Reader Service Card

Continued on next page

This Window Hardware



was die cast of Zinc at a cost of only

4½ CENTS* PER SET OF 3 PIECES!

CAN YOU DUPLICATE PARTS OF THIS SIZE FOR SO LOW A COST ON YOUR PRESENT DIE CASTING EQUIPMENT — OR BY ANY OTHER METHOD?

* Using a 6 cavity die — 475 shots, a total of 2850 (950 sets) quality, hardware finish castings were produced on this

LOW COST • HIGH SPEED
American Die Casting Machine

Model 60HYD

Delivered READY-TO-RUN — NOTHING ELSE TO BUY!

OVER 1100 Free Cycles Per Hour —— Shot Capacity Up To **3 Lbs.**

Speed up your PRODUCTION . . . Increase your PROFITS!

Now you can run high grade castings, up to 3 lbs., at high speeds and low operating costs. Actual tests operating 8 hours a day, 5 days a week, show total cost of gas and electricity of ONLY 17¢ PER HOUR!

Outstanding features include — all steel welded construction — automatic electric cycling at high speed — 17¾" x 17¾" die platens — 6½" die stroke — highest grade controls and valves mounted for easy maintenance and accessibility — a complete package with self contained unit.

Available in Air or Hydraulically operated plunger gooseneck type for zinc, tin or lead, or, cold chamber type for aluminum, brass and magnesium.

Users of American Die Casting Machines
AJAX DIE CASTING CO.
CHANDLER MFG. CO.
GENERAL MOTORS CORP. Rochester Prod. Div.
HELFRICH DIE CASTING CO.
NEWTON-NEW HAVEN and others

Write for FREE illustrated folder containing complete data on all models.

AMERICAN DIE CASTING MACHINERY CO.

1519 Thomas St. PHONE: Armitage 6-3334 Chicago 22, Ill.

For more information circle No. 8 on the Reader Service Card

INTERCHANGEABLE BARRELS . . . in finishing machine

A new barrel finishing machine with a total capacity of 8 cu. ft. that may be made up of one or a combination of barrels has been offered recently. Barrels of 2, 4, 6 or 8 cu. ft. capacity are available for use interchangeably or in combination.

Other improved or new features claimed for the machine are an improved power drive using direct gearing with no chains or sprockets to provide lowered maintenance costs. A safety gate at the front of the machine for complete protection. A 1½ HP magnetic brake motor with jogging attachment and reverse switch.

Rampe Mfg. Co.
For more information, circle No. 214 on the Reader Service Card

SILICATE BASE CORE BINDER . . . for CO_2 hardening process

A new silicate base core binder for use with cores hardened by the CO_2 process has been announced.

According to the manufacturer the new material gives cores with a T/C ratio of about 12 as compared with other binder materials with a T/C ratio of from 6 to 8.

No new equipment or techniques are required for the binder. Conventional mixing equipment is adequate and the usual method of hardening with CO_2 gas is used. Cores hardened in from 15 to 20 seconds can be used immediately after molding, no ovens for baking are required.

The new binder gives a mixture having excellent plasticity and good flow properties. This means easy ramming and positive, complete filling of the core box cavity.

Pronco Products, Inc.
For more information, circle No. 209 on the Reader Service Card

CONTOUR PROJECTOR ACCESSORIES

. . . increase usefulness

Three new accessories have been introduced that materially increase the versatility of some models of the company's contour projectors.

A special glass measuring stage for use in vertical projection, permits making linear measurements over a range of 2″ x 1″. The stage is calibrated in either 0.001″ or 0.0001″.

For measuring angles a rotary screen is available which replaces the standard ground glass screen and is used in either a horizontal or vertical position. Angles of 5′ can be measured.

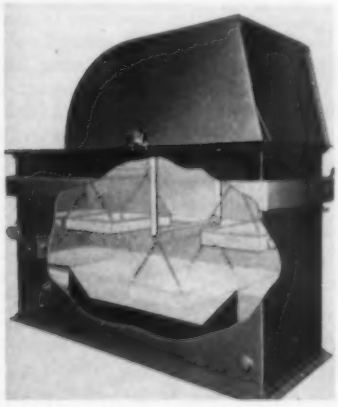
A third accessory for horizontal projection, is an overlay chart holder permitting the use of existing plastic or ground glass charts.

All three accessories fit the Contour Projector, Model 8.

Eastman Kodak Co.
For more information, circle No. 216 on the Reader Service Card

VAPOR DEGREASER

. . . has preset cycle



A new type vapor degreaser has been announced that features a preset, predetermined cleaning cycle. In addition to vapor degreasing, the new unit has a dip rinse to remove chips and other insoluble matter.

In addition to cleaning exposed surfaces, the dip rinse serves to clean blind holes and recesses. The dip rinse further serves to cool the work to give an additional condensing vapor stage of degreasing.

Units range in capacity from 1800 to 4000 lbs per hour and are available in electrically heated, steam heated and gas heated models.

Phillips Manufacturing Co.
For more information, circle No. 208 on the Reader Service Card

RHODIUM PLATING SOLUTION

. . . for heavier deposits

A new rhodium plating solution has been made available that is designed specifically to produce heavier deposits with lower stress in a shorter time.

The solution, known as Solution No. 221, plates up to 0.001 in. in 70 minutes. It can be used with present equipment.

While the bath is intended for producing specification deposits, it may be used with excellent results for decorative purposes, especially where plating speed is important.

Rhodium deposits from this bath are extremely useful in many electrical and electronic applications. In general, rhodium protects against corrosion and improves efficiency wherever a low-resistance, long wearing, oxidation free contact is required.

Baker & Co., Inc.
For more information, circle No. 211 on the Reader Service Card

YESTERDAY
TOMORROW
The Trend is with Badger . . .
BADGER quality makes your product more competitive!
• Zinc and Aluminum Die Castings •
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DIE CASTING CORP.
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For more information circle No. 14 on the Reader Service Card

There's safety in these numbers

UCON Brand **Hydrolube 200-N**
(Viscosity—approx. 200 S.U.S. at 100° F.)

UCON Brand **Hydrolube 300-N**
(Viscosity—approx. 300 S.U.S. at 100° F.)

UCON Brand **Hydrolube 550-N**
(Viscosity—approx. 550 S.U.S. at 100° F.)

Yes, there's safety in the three standard viscosity grades of UCON *Hydrolubes—*CARBIDE*'s safety hydraulic fluids.*

Safety for men and property

● The resistance of UCON Hydrolubes to burning has been proved by years of severe, exhaustive testing in the laboratory. AND, *in actual service*, UCON Hydrolubes have prevented serious fires and injury during their more than 8 years of routine use. UCON Hydrolubes are water-base hydraulic fluids—the water content is the key to their non-flammability.

● And, for all practical hydraulic purposes, UCON Hydrolubes are non-toxic to workmen.

Safety for machines

UCON Hydrolubes

● Have no harmful effects on packings and seals. Leakage losses are often lower than with other hydraulic fluids.

● Contain effective liquid and vapor phase corrosion inhibitors for the common metals.

● Have good lubricity. Special anti-wear agents provide satisfactory pump life and performance characteristics.

● Have high viscosity indexes—150 to 160.

● Have low pour points—can be used at sub-zero temperatures.

● And, are made in the three standard viscosity grades—others can be supplied to fit specific requirements.

For safety's sake, get all the facts. Write *today* for the booklet, "UCON Hydrolubes," Form 7380.

CARBIDE AND CARBON CHEMICALS

CARBIDE AND CARBON CHEMICALS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC **New York 17, N. Y.**

"Ucon" is a registered trade-mark of Union Carbide.

For more information circle No. 21 on the Reader Service Card

STRIPPABLE COATING . . . for spray booth

A new sprayable paint booth coating that strips off in large pieces in seconds has recently been introduced.

Applied by either spray or brush to dry booth surfaces, the new material is said to dry fast and to cling tightly to vertical surfaces under paint over-spray. When painting has been completed, the film peels off readily with a minimum of prying with a knife and a minimum of shredding.

The new product is said to have the consistency of paint, to be odorless, non-toxic and non-hazardous to store and use. Operators using it do not need to wear respirators.

Oakite Products, Inc.
For more information, circle No. 210 on the Reader Service Card

COATING FOR ALUMINUM . . . features "quick fix"

Development of a process that is said to provide aluminum with a surface conversion coating for protection against corrosion, for improvement of paint adhesion and for ornamentation has been announced.

An advantage of the new process over similar processes is said to be the "quick fix" offered only by this process. The coating becomes fixed and non-smearing immediately upon application, whereas most other coatings will smear or streak if parts processed are handled or moved while still wet according to the manufacturer. Drying is, thus, made unnecessary.

The coating formed by the new process is said to be a surface conversion type. That is, the coating is actually partially derived from the metal surface itself and is, therefore, firmly interlocked and integral with the metal surface. The nature of the coating is such that it must extend into every crevice on the surface of the article being treated.

Turco Products, Inc.
For more information, circle No. 215 on the Reader Service Card

ADJUSTABLE REAMERS . . . supplied in 19 sizes

An adjustable floating reamer featuring positive micrometer adjustment and constant float is now available in 19 units to cover the size range from ½" to 4".

Continued on page 76

For more information circle No. 76 on the Reader Service Card

Cut Die-Making Cost

by reducing set-up time as much as 90%

With Jig Boring Accuracy

ADVANCE CROSS-SLIDE ROTARY TABLE

*Proved by actual on-the-job performance

permits fast, precise positioning of work-piece from ONE SET-UP. No unclamping and reclamping on your standard vertical mill equipped with ADVANCE Cross-Slide Rotary Table. Only your milling machine's table movement limits the size radius you can cut.

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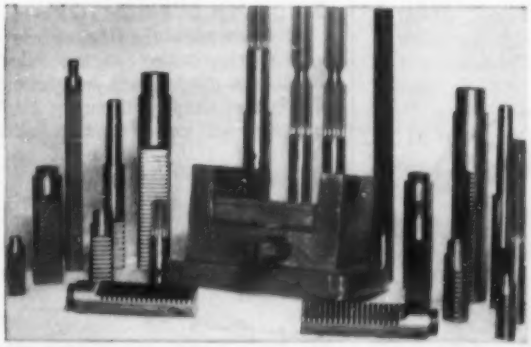

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Precision Products Since 1921

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For more information circle No. 48 on the Reader Service Card

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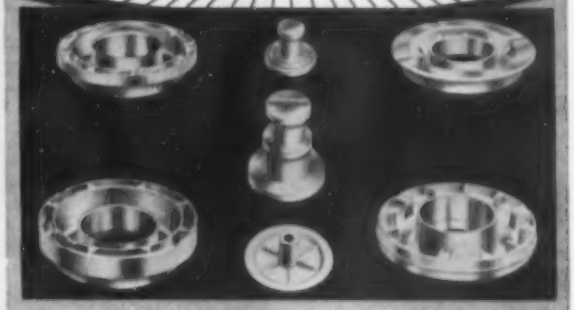

SERVO and CONTROL PISTONS for AUTOMATIC TRANSMISSIONS by LITEMETAL

Within the past 5 years new equipment and techniques have made possible the die casting of aluminum Servo and Control Pistons for automatic transmissions. Previously, die casting proved unsuitable for components such as these. Now, die cast by LITEMETAL, these pistons push, pull and control in accordance with rigid engineering specifications and standards . . . they represent the practicability of aluminum die castings in hydraulics for the automotive and industrial fields.

Aluminum or magnesium die castings by LITEMETAL have almost unlimited applications and are used extensively . . . being mechanically strong, dependable . . . and economical. Besides effecting great savings in time and materials, the die casting process virtually eliminates costly labor otherwise required for machining and finishing. In addition, the savings in weight facilitate inplant handling and often greatly reduce shipping costs.

Let's Talk It Over . . .

LITEMETAL DICAST, INC. is an organization of specialists — men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs — little machines for little jobs . . . the right sizes and types of the most modern die casting equipment for producing parts from the size of a button to large cable spools. Complete facilities for secondary operations are also available.

Write today for literature and design information. Quick action on inquiries.

LITEMETAL DICAST Inc.

A DIVISION OF HAYES INDUSTRIES

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PLANT AND EXECUTIVE OFFICES

For more information circle No. 41 on the Reader Service Card

For more information circle No. 6 on the Reader Service Card

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For Outstanding Structural Parts, Porous Media and Self-Lubricating Parts Requiring Any or All of These Properties . . .

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producers of
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for the production of zinc die castings which are the last word in structure, design and performance. In our expanded quarters we have installed the very latest equipment to serve you better and faster. As one of the oldest die casting firms in the midwest we would welcome the opportunity to quote on your requirements. ***INQUIRIES INVITED***

STROH DIE CASTING Co. INC.
11123 W. Burleigh St., Milwaukee 10, Wisconsin

For more information circle No. 54 on the Reader Service Card

NEW PRODUCTS—Continued

The two blades of the tools are adjustable by a direct reading micrometer and have positive and constant float. Adjustment can be made with the reamer in position and the blades may be reground in the usual manner without affecting the micrometer reading.

The blades can be supplied in either high speed steel or tungsten carbide tipped.

Wickman Mfg. Co.
For more information, circle No. 213 on the Reader Service Card

BANTAM SIZED VIBRATOR . . . for air or steam operation

Recently developed, a bantam sized vibrator for operation on either air or steam is now being marketed. The new unit, called the Vibrolator SAH 10, weighs only 4 ounces and is said to be the lightest full-powered mechanical vibrator available.

The device is designed for use on hoppers, feeders, molds, gauge panels, packaging machines, etc. Frequency of vibration is infinitely variable from zero to more than 50,000 cycles per minute. Operating pressure may vary from 5 to 150 psi. The vibrator is self starting, self cleaning, spark-proof and quiet in operation.

Martin Engineering Co.
For more information, circle No. 212 on the Reader Service Card

GUIDE PIN LUBRICATOR . . . increases die life

A recriprocating spring oiler for die set guide posts, consisting of a barrel shape coil spring 2½" long that will compress to a solid height of 3/16" has been announced.

The spring coils are completely covered with a tough, highly absorbent tubular wick. The end coils are the same diameter as the guide posts and the resilience of the spring wire presses the wick snugly all around the post and oils it at every stroke of the press.

For long guide posts, two or more oilers are used and for oiling to the very top of the post, the lubricator can be stretched 25 percent or more without impairing its usefulness. One or more coils can be snipped from the lubricator to attain any desired length.

William V. Heinz
For more information, circle No. 217 on the Reader Service Card

NEWS OF INDUSTRY AND ASSOCIATIONS

NEW GROUP BUYS ALUMINUM INDUSTRIES

Harrison O. Ash, President of Aluminum Industries, Inc., Cincinnati, Ohio, makers of Permite Products, announces that a group of Cincinnatians headed by Thomas E. Wood, James R. Williams, and himself, have acquired control of Aluminum Industries through the acquisition of all of the stock in Aluminum Industries held by Champion Industries. Wood, Williams and Ash are now directors of Aluminum. Management of the Company is not affected by this transaction.

Mr. Ash said that the recent expansion program of Aluminum Industries, Inc. will be accelerated. He further stated that since the announcement last year of their $1,500,000 expansion program, all operations in Cincinnati were consolidated at the Company's Werk Road division. This move resulted in an expansion of all existing facilities, including the erection of new buildings for a modern parts division plant with new equipment, a modern enlarged engine valve and machining plant, and modernization of the aluminum foundry with latest mechanized equipment.

HEADS REED-PRENTICE

Donald H. Dalbeck has been elected president of Reed-Prentice Corporation, Worcester, Mass. and of Package Machinery Co., East Longmeadow, Mass. Reed-Prentice is a wholly-owned subsidiary of Package Machinery.

Roger L. Putnam, Sr., chairman of the board of directors, announced the election and advised that Mr. Dalbeck will continue to serve as treasurer of both companies. Roger L. Putnam, Jr., controller and secretary of Package Machinery, assumes this position for Reed-Prentice also.

J. Joseph Kelly, vice-president in charge of sales, has been elected to the Reed-Prentice board of directors. Iver G. Freeman, vice-president of engineering and research, has been named chairman of the Management Committee.

TRI-STATE DIE CASTING BOUGHT BY BUCKLEY

Patrick J. Buckley, Chicago industrialist, has announced his purchase of Tri-State Plastic Manufacturing Co., the Evansville Merchandise Co., Empire Warehouse Company, Tri-State Plastic Molding Co., Inc., and its subsidiaries, Tri-State Die Casting Corp. and Plastic Block City, Inc.

DOEHLER-JARVIS EXPANSION PROGRAM ADDS 35-MILLION POUNDS TO CAPACITY

An expansion program which will increase the capacity of the die casting facilities of the Doehler-Jarvis Division of National Lead Company by 20,000,000 pounds of aluminum and 15,000,000 pounds of zinc per year has been announced by Joseph A. Martino, president of National Lead.

This program will involve the extension of existing buildings, the addition of new die casting machines, and provision of related electrical and hydraulic facilities. The expansion will take place at plants in Toledo, Ohio; Pottstown, Pennsylvania; Grand Rapids, Michigan, and at Barber Die Casting Co., Ltd., in Hamilton, Ontario, subsidiary of National Lead. Completion is scheduled for the middle of this year.

At the Toledo plant at 1945 Smead Avenue, additional aluminum die casting machines will be installed, increasing metal consumption by about 10,000,000 pounds per year. Also, the 25-cycle electrical current system and a 5,000 KWA sub-station is being set up to cover future de-

Continued next page

POWDER METAL GROUP REELECTS BOORKY AT ANNUAL MEETING

NEW OFFICERS of the Metal Powder Association include: left to right, J. S. Speer II, Per Ulf Gummeson, Carl Johnson, Morris Boorky, Ernest Klein, and T. L. Robinson. Others not shown include: Lewis W. Davis, R. D. Ponemon, D. L. Almquist, George Stern and W. A. Irvine.

More than 800 members and guests took part in the 12th annual meeting of the Metal Powder Association in Cleveland last month. Attendance at the meetings and show included engineers, designers and manufacturers from all parts of the nation.

In addition to the series of technical papers on many powder metallurgy subjects, the keynote speaker was Dean Karl B. McEachron of Cleveland's Case Institute of Technology who warned the group of an increasing shortage in the supply of technically trained personnel.

"At the present rate of expansion of our economy," he told a luncheon gathering, "the need for technically trained personnel will continue to increase at such a rate that the increased numbers of people graduating from high schools and colleges in the 1960's will still not meet the demand of that economy."

Reelected head of the Metal Powder Association was Morris Boorky, president of Presmet Corp., Worcester, Mass., with Lewis W. Davis of Metal Hydrides, Inc., first vice president.

For more information circle No. 13 on the Reader Service Card

IT IS HARD TO BELIEVE But AUTO-DIESEL PLUNGER RINGS have lasted OVER 122 DAYS

It doesn't seem possible but Auto-Diesel Hardened Steel Plunger Rings have lasted over 122 days—they were immersed in molten zinc over 800 hours. IN MANY PLANTS THEY ARE GIVING OVER 100,000 SHOTS PER SET. (Names supplied upon request). This reduces down-time and the cost of maintenance. Made of cast iron, dieloy cast iron or hardened steel. If you operate die casting machines or cast zinc parts write for information.

REDUCE COSTLY DOWN-TIME

use AUTO-DIESEL Two or Three Piece PLUNGER SEGMENT RINGS

These rings are designed for use in hot chamber die casting machines and reduce costly down-time to the minimum. They give LONG LIFE and reduce the cost of maintenance. Made of high grade wear resisting iron in sizes from 1½" to 4".

Write for Details

THE AUTO-DIESEL PISTON RING CO.
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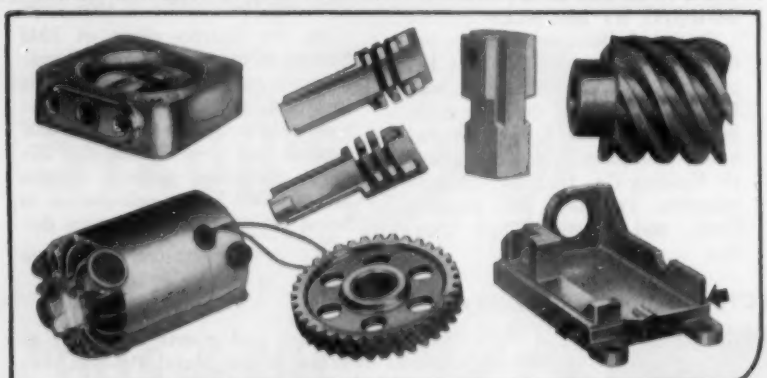
"RINGS and SHAPES Since 1921"



DIE CAST PARTS *to Your Specifications*

A pioneer in the die casting art, *Milwaukee* has long been a recognized leader in supplying *Die Castings as Specified* to all types of industry for all types of products from small precision instruments to massive heavy duty machinery. That is why you can entrust *Milwaukee* to produce die cast parts to your most exacting specifications — not only in dimensions — but in contour, weight, strength, pressure resistance, wear resistance, finish and other vital characteristics.

We Operate under the Certified Zinc Plan of the American Die Casting Institute, Inc.

MILWAUKEE DIE CASTING COMPANY
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Established 1909

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mands of the expanded production program.

The additions at the Toledo plant at Dixie Highway and Willamount Road include new large die casting machines capable of handling aluminum castings weighing up to 30 pounds. These machines will be installed in a new plant wing with hydraulic stations and improved facilities. Other casting machines will also be added in the existing building space to produce automobile grills and mouldings, large automatic transmission housings and other parts weighing up to 20 pounds in aluminum or to 50 pounds in zinc. Capacity at this plant will be increased by approximately 10,000,000 pounds of aluminum annually.

Doehler-Jarvis' Grand Rapids operation will add almost 100 per cent to its die casting capacity with the installation of new modern die casting machines in new building space. The addition of these machines will increase the use of zinc in Grand Rapids by approximately 15,000,000 pounds per year. In the past, the Grand Rapids plants have primarily engaged in finishing and plating operations. The Grand Rapids operations will also be expanded in the fields of color anodized aluminum stampings and forgings, and assembled products.

A new alloying facility has been built at Pottstown plant No. 2 to permit more efficient metal recovery and utilization, and also insure a more efficient supply of molten metal to the die casting machines. At Pottstown plant No. 1 a new sub-station for 33,000 volts is being built to cover the additional demand for electrical current. Capacity of the painting department has been doubled at this location.

Barber Die Casting Co., Ltd. will install its first large die casting machine with capacity of 20 pounds in aluminum and 50 pounds in zinc to meet the growing demand for larger castings in Canada.

ARWOOD PRECISION JOINS INVESTMENT CASTING INST.

Arwood Precision Casting Co., Brooklyn, N. Y., has joined the Investment Casting Institute, Chicago, according to an announcement by V. S. Lazzara, Institute president.

The ICI is composed of 48 producers of investment castings and supplies for investment casting.

it's

CRUCIBLE REXALLOY

for abrasion, corrosion and heat resistant parts...with better finish

1. One of a pair, this blade of REXALLOY A shears hot glass during manufacture of TV tubes. Liquid cooled between operations, it offers maximum resistance to wear, corrosion, and thermal shock. REXALLOY blades outperform previously used high speed steel shears by a wide margin.

2. Nozzle for jet type oil well rock bit cutter. Made of REXALLOY 51, it stands up exceedingly well under severe cold abrasive conditions encountered in drilling oil wells.

3. Extrusion die insert of REXALLOY 33. Inside contours are cast within a few thousandths of finished size. REXALLOY inserts produce as many as six to ten times as many pushes as conventional hot work tool steel extrusion dies.

Here's what Crucible REXALLOY means to you: Castings of high hardness, even at elevated temperatures . . . excellent resistance to both corrosion and abrasion . . . smooth, clean finish.

What's more, REXALLOY castings, when made by the shell-mold process, can be cast to any shape. Dimensions are held to closer tolerances than ever before . . . practically all machining and grinding operations are eliminated—especially important with hard super-alloys like REXALLOY.

So if your application calls for a part with one or more of these characteristics, REXALLOY shell-molded castings are the answer. They are moderate in price (less than investment castings), closer in dimensions and finish than conventional castings. Let your Crucible representative give you the complete story of what they can do for you. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

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UN-BREAKABLE
tempered and treated
stainless steel
die casting

PLUNGER RINGS

give up to

8 to 10 TIMES
THE AVERAGE LIFE
of
Die Casting Plunger Rings

Name the largest die casters and you will have the users of Precision Un-Breakable Tempered and Treated Stainless Steel Die Casting Plunger Rings. The reasons are many . . . here are a few.

1. Precision Die Casting Rings are wrought, **not cast**, from dense, fine grain, flawless stainless steel.
2. They are formed to have uniform tension throughout the entire circumference.
3. They have flexibility and resiliency . . . yet withstand excessive temperatures without collapsing.
4. Special heat treatment processes give Rockwell C-48-55 hardness, yet . . . rings remain un-breakable.
5. Precision Rings are available specifically for die casting machines in various widths to suit your present and proposed plunger grooves.
6. They are engineered to let the ring take the load of sealing and maintaining pressure.

Precision's Engineering Department can solve your problems on die casting . . . increase machine productivity through longer ring life . . . reduce rejections and operating costs.

Write today for our recommendations on rings for your die casting plungers.

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LOS ANGELES—SAN FRANCISCO—
NEW YORK—PHILADELPHIA

Circle No. 51 on the Reader Service Card

WEST COAST INVESTMENT CASTER EXPANDS

Ferro Cast Corp. has completed negotiations for the leasing of new quarters located at 2202 Broadway, Santa Monica, California. The plant consists of 15,000 sq. ft. of floor space in a modern brick building. Acquisition of this building more than doubles the manufacturing space which the company has been utilizing in the past five year period.

Ferro Cast manufactures investment castings utilizing the "lost wax process." The company claims that utilization of this increased capacity will make it the largest producer of both ferrous and non ferrous precision castings on the west coast.

RELEASE MOVIE ON HYDRAULIC PRESSES

"Pressure on Metalworking Production," a new motion picture available from Lake Erie Engineering Corp., demonstrates how hydraulic presses have sparked the new technique of forcing metal into a desired shape rather than removing the metal by machining. Action shots of various installations throughout the country illustrate the use of hydraulic presses for stretch-forming, cold-extrusion, flanging, forging, drawing, and forming.

Close attention is paid to details of operation such as die set-up, stroke and pressure adjustments, long and short stroke work. The differences between single, double, and triple action presses are illustrated by actual presses and animated sequences.

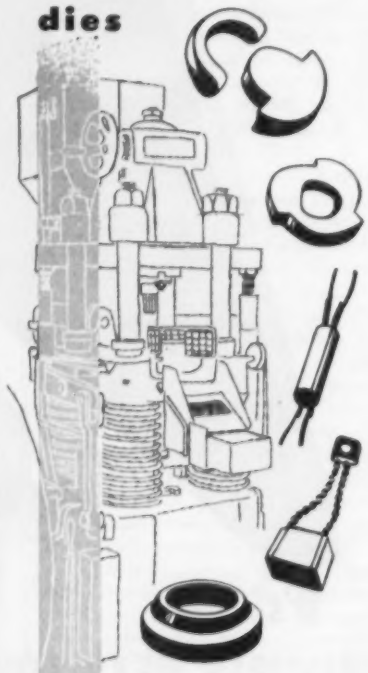
Also discussed are the advantages of rugged construction, extra-capacity oil reservoirs, forged steel cylinders, engineered hydraulic piping system, quick-set stroke controls, and simplified electrical system. The 16 mm color film is available free from Lake Erie Engineering Corp., Box 68, Kenmore Station, Buffalo 17, N.Y.

RELOCATES OFFICE

Joseph J. Schmidt, representative for Lester injection molding machines and die casting machines in the Chicago area, has relocated his office at 5875 North Lincoln Avenue, Chicago, Illinois; telephone, Longbeach 1-9556.

PRECISION "Know-how"

in building high production compacting dies



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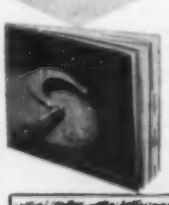

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Its tenth anniversary as a producer of investment castings will be celebrated during 1956 by the Engineered Precision Casting Company, Matawan, N. J.

Founded by Walter A. Dubovick and Alexander Grant, who today hold the positions of president and vice president respectively, the company now has 70 employees. It is a charter member of the Investment Casting Institute and Dubovick is currently head of the Institue's Process Maerials Standards Committee.

SEL-REX EXPANDS

Sel-Rex Products Division has established new offices in Detroit, according to an announcement from Morris M. Messing, president, Bart-Messing Corp. and Sel-Rex Precious Metals, Inc.

Sales coverage as well as dealer-distributor liaison for Sel-Rex products will be under the direction of S. S. Wilson, sales manager and will extend throughout the midwest, including Michigan, Minnesota, Indiana, Illinois, Ohio, Wisconsin and Iowa.

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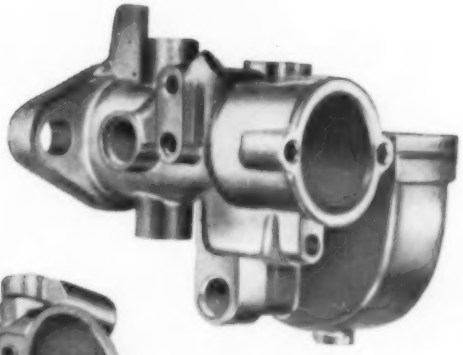
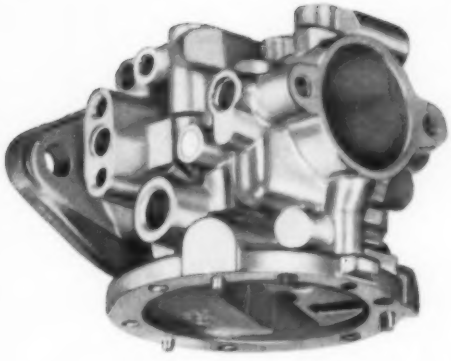
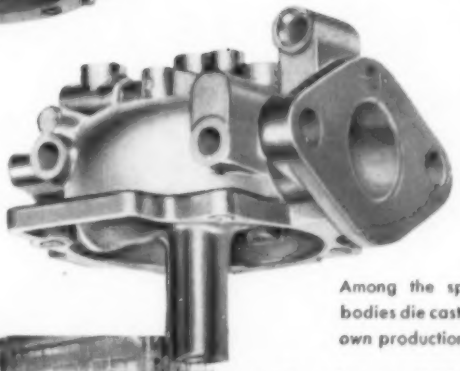




Tillotson Manufacturing Co. writes:

"DIE CASTINGS BY HOOVER

help us make a much better product at a much lower cost"



These complex die castings, produced by Hoover for the makers of the famous Tillotson Carburetors, are notable for their intricate coring and many close tolerances. They contain holes on all sides which must be perfectly aligned, and sections of the castings must be free from porosity to prevent leakage.

Among the specific advantages of having their carburetor bodies die cast by Hoover . . . advantages that may apply to *your* own production problems . . . The Tillotson Company points out:

- **Broader possibilities in engineering design.**
- **Saving in machining time due to large percentage of small holes cored to size and flat surfaces cast smooth.**
- **Saving of number of machines in production line.**
- **Longer tool life, fewer tools required.**
- **Cleaner to handle, less scrap in plant.**
- **Almost complete elimination of rejects.**
- **Smoother, neater appearance and strength with lightweight which have increased our sales tremendously.**

The Hoover Company's complete production facilities for promptly meeting your requirements include 8 zinc die-casting machines, and 27 aluminum die-casting machines carrying ratings up to 400 tons. Castings can be produced from the smallest practical size up to 12" x 12" area and 8 lbs. weight for aluminum and 7" x 10" and 5 lbs. for zinc.

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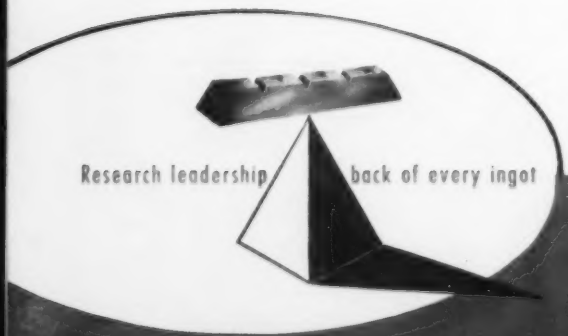

Send without obligation for information covering complete specifications and properties of Apex Z-39.

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